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VAN DER PLANK (J. E.). **Some suggestions on the history of Potato virus X.**—*J. Linn. Soc. Lond.* (*Bot.*), 53, 352, pp. 251–262, 1949.

Studies on the history of potato virus X [*R.A.M.*, 27, p. 577] revealed that it became destructive in Europe and South Africa only in this century, and if it existed previously at all, was of little importance. Potatoes of diverse varieties brought into Basutoland and Tristan da Cunha in the last century and since grown in isolation there are free from virus X. Therefore, the clones introduced must have been healthy. Northern Star, introduced into Kenya from Britain at the beginning of the century (and accepted there under the names Kinongo and Kerai) is also free from virus X [ibid., 26, p. 234]. In Up-to-Date the virus was still uncommon in Britain up to about 1910; it became seriously destructive about 1920, and almost universal about 1930. In America the infection apparently started earlier. It is possible that the virus came into the United States with Central or South American potatoes and took many years to multiply.

Whereas a century ago innumerable and mostly short-lived varieties were grown, nowadays they are relatively few and mostly long-lived, giving the virus a chance to accumulate. The modern 'seed' industry controls leaf roll and severe mosaic, but not virus X except in its more severe strains. Ordinary strains cause losses of about 20 per cent., infected 'seed' being responsible for an annual world loss of some 800,000,000 bush. The author considers this an indictment of the organization of the 'seed' industry and a warning against the danger of abandoning varietal abundance and novelty in crops which are propagated by vegetative means.

BLACK (W.). **Disease resistance in Potatoes.**—*Farming, Norwich*, 1, pp. 327–331, 5 figs., 1947.

This paper presents up-to-date information on resistance in potatoes to blight (*Phytophthora infestans*) [*R.A.M.*, 27, p. 151], common and powdery scab (*Actinomyces scabies* and *Spongospora subterranea*) [ibid., 27, p. 579], blackleg (*Bacillus phytophthorus*) [*Erwinia phytophthora*], mosaic (viruses A, X, and Y), and leaf roll [loc. cit.], most of which has already been noticed in this *Review*.

Some wild species, e.g. *Solanum commersonii*, *S. chacoense*, and *S. jamesii* are immune from *A. scabies*, but very difficult to cross. On the other hand *S. araccpapa*, *S. mamilliferum*, *S. rybinii*, *S. curtilobum*, and some varieties of *S. andigenum* and *S. tuberosum* which are immune from *S. subterranea* cross relatively easily with commercial varieties. Certain varieties of *S. andigenum* possess some resistance to blackleg, and *S. acaule* is immune; the latter requires, however, many generations of back-crossing, whereas the former is more useful for quick results.

Of the viruses and virus strains causing mosaic, viruses A, X, and Y are considered the most damaging. About half the British potato varieties are field immune from virus A, less than one-fifth from virus X, but none from virus Y. Those field immune from X (e.g. King Edward VII, Epicure, Ninetyfold, Arran Crest, and

Craigs Defiance) are also field immune from virus A, because the two characters are closely linked genetically. Some European and American varieties exhibit some degree of resistance to virus Y and it appears possible to intensify this resistance by breeding methods. Certain Australian seedlings, as well as some wild species [ibid., 26, p. 75], showed field immune reactions to infection with virus Y, and they will be valuable in further breeding work.

No form of immunity from leaf roll has been found either among cultivated or wild species, but certain old varieties, e.g. Shamrock and Southesk, possess a high degree of resistance. By inbreeding within the resistant varieties the resistance can be intensified.

DAVIDSON (R. S.). **Factors affecting the development of bacterial soft rot of Potato tuber initials.**—*Phytopathology*, 38, 9, pp. 673–687, 1948.

A tabulated account is given of studies at the Minnesota and Rhode Island Agricultural Experiment Stations on the factors influencing the development of soft rot in Irish Cobbler and Green Mountain potato tuber initials. At least four bacteria were found to be concerned in the process, viz., *Erwinia carotovora*, *E. aroideae*, *Bacillus mesentericus* [*R.A.M.*, 8, p. 195], and *B. polymyxa* [ibid., 25, p. 357; 26, p. 48]. In wet soils rotting was occasionally so extensive as to suggest its responsibility for the low yields obtained. In both the sandy loam soils used, one very fine, the rotting was most abundant when they were saturated to capacity. Of 30 isolates originating in the lenticels (the sole channel of infection in these experiments) of tuber initials and plant stems in sandy loam, 26 were identified as *E. carotovora* [ibid., 26, p. 353] and three as *B. polymyxa*. Tuber initials grown in very fine sandy loam yielded *E. aroideae*, *E. carotovora*, and *B. mesentericus* eight, four, and three times, respectively. It would thus appear that the relative prevalence of the soft rot bacteria may vary in different regions or soils.

The development of lenticel infection is retarded by soil temperatures of 18° C. and below and accelerated at higher ones. For instance, all tuber initials grown in saturated soils at 39° became infected within 24 hours, whereas a period of 96 hours was required to produce the same effects within a range of 4° to 18°. There were more lenticels on Irish Cobbler than on Green Mountain tuber initials, and the percentage and extent of lenticel proliferation were greater in the former than in the latter variety. This process results in the rapid formation of thin-walled, irregularly distributed complementary cells with large intercellular spaces and deprived of the normal underlying cork layer which protects the lenticels against invasion by the class of pathogens under observation [ibid., 9, p. 670]. Lenticel infections were, in fact, more numerous on Irish Cobbler than on Green Mountain tuber initials, but the differences were not statistically significant.

Blackleg symptoms, as described by Morse (*J. agric. Res.*, 8, pp. 79–126, 1917), were observed on plants grown in saturated soil at temperatures of 21° and upwards, with an optimum for disease expression between 34° and 39°.

STAPP (C.). **Neuere Untersuchungen über die Resistenzverschiedenheiten deutscher Kartoffelsorten gegen Bacterium phytophthorum Appel.** [Recent investigations on the differences in resistance of German Potato varieties to *Bacterium phytophthorum* Appel.]—Reprinted from 'Festschrift Appel', Biologische Zentralanstalt, Berlin-Dahlem, 2 pp., 1947. [Received March, 1949.]

As a result of further tests in 1944 on the reaction of 64 officially recognized German potato varieties to *Bacterium phytophthorum* [*Erwinia phytophthora*: *R.A.M.*, 16, p. 708], seven were placed in the resistant category, namely, Carnea, Flava, Johanna, Priska, Robusta, Sickingen, and Stärkeragis, and 18 in the moderately resistant, i.e., Ackersegen, Alpha, Aquila, Centa, Depesche, Edelgard, Frühgold, Frühnudel, Krebsfeste, Kaiserkrone, Möwe, Parnassia, Pepo, Sand-

nudel, Speisegold, Tiger, Voran, Weisses Rössl, and Weltwunder. Of the remainder, 21 fell into the susceptible group, 15 into the highly susceptible, and four into the very highly susceptible classes.

In accordance with previous observations, no close correlations could be established between the reaction to black leg and varietal characteristics, such as time of maturity, thickness of skin, capacity for wound periderm formation, and rate of disorganization of the parenchyma tissue. The differences in pathogenicity already noted between strains 14 and 43 of *E. phytophthora* were maintained in these experiments.

ATKINS (J. G.) & BOUCHEREAU (P.). **Seed treatment tests with water-planted Rice.**—Abs. in *Phytopathology*, 39, 1, p. 2, 1949.

In three preliminary seed treatment tests on water-planted rice in Louisiana in March and April, 1948, using the slurry method (except for yellow cuprocide), emergence was not increased by arasan S.F. (75 per cent. tetramethyl thiuram-disulphide), the standard fungicide in the State for drilled rice, either alone or with the stickers, 31X and p.e.p.s. Dow 9B wettable (a trichlorophenate) caused a drastic reduction in emergence. Yellow cuprocide, however, produced an average increase of 53·8 per cent. in emergence over untreated seed. The yield differences between untreated, yellow cuprocide, and arasan S.F. treatments were light. The emergence of pre-sprouted, water-planted rice in pots filled with rice field soil was increased by treatment with yellow cuprocide, red copper oxide, and tribasic copper sulphate. The first-named caused some inhibition of root development in the pot series of tests, which was not apparent in the field experiments.

GROSSBARD (ERNA). **Plant diseases. 4. The control of plant diseases by microbial antagonism.**—*Rep. exp. Res. Sta. Cheshunt, 1947*, pp. 29–39, 2 graphs, 1948.

Continuing her investigations into the production of clavatin by *Penicillium patulum* [cf. *R.A.M.*, 26, p. 185; 27, p. 113] in the soil, the author obtained experimental evidence indicating that this organism produces an antibiotic in sterilized soil when wheat straw is added. Liquid extracts from the medium completely inhibited *Bacterium phytophthorum* [*Erwinia phytophthora*], *Bacillus mycoides*, *Phytophthora parasitica*, *P. cryptogea*, and *Corynebacterium fascians* in serial dilution tests. Its inhibiting power was greatly increased when glucose was added. With soil plus glucose the degree of inhibition was much greater than with soil plus straw. Extracts from inoculated soil alone did not inhibit the growth of the test organisms.

Sugar beet pulp mixed with molasses proved to be a very satisfactory medium for the production of the antibiotic by *Penicillium patulum*, while bracken plus glucose was almost as effective as fresh wheat straw. The inhibitory agent persisted in both for a lengthy period, though vegetative growth and spore formation were slow and sparse. In sterilized soil 2·5 per cent. dried molassed sugar beet pulp induced antibiotic production by *P. patulum* far more satisfactorily than wheat straw; it was equivalent to glucose in inhibition of the test organisms and can well replace it. Antibiotic activity persisted for four months in wheat straw cultures and their extracts and for more than seven months without reduction in activity in cultures of *P. patulum* in wheat straw plus glucose.

When other organisms known to produce antibiotics were cultured on autoclaved wheat straw *Aspergillus terreus* and *Streptomyces antibioticus* produced a substance inhibiting *B. mycoides*.

Sterilized soil in seed boxes was inoculated with a sand oatmeal culture or a wheat straw culture of *P. patulum* (control boxes without the fungus) and subsequently sprayed at regular intervals with water or glucose solution. After 14 days' incubation in a glasshouse a culture of *Phytophthora parasitica* was uniformly

mixed into the whole or part of the soil. After three weeks' further incubation 150 tomato seeds per box were sown. The results showed that where the whole box was inoculated with *P. parasitica* the rate of emergence of the seedlings was greater in the presence of *Penicillium patulum* and the incidence of damping-off slightly reduced, with one exception. Where the inoculation with *Phytophthora parasitica* was confined to the centre of the box, fewer seedlings emerged than in boxes without the antagonist, but the virulence of damping-off was somewhat less, especially in the soil-straw glucose substratum. Damping-off was greatly stimulated in the straw-soil medium.

KEYWORTH (W. G.). **Diseases of Hops.**—*Rep. E. Malling Res. Sta., 1947*, pp. 46–47, 1948.

Eight outbreaks of *Verticillium* wilt of hops [*V. albo-atrum*: *R.A.M.*, 27, p. 584] were newly reported from Kent and Sussex in 1947. Two were severe progressive outbreaks of at least two years' standing, and one of these two, in an old garden of the Brewer's Favourite variety near Maidstone, was about five miles from the nearest progressive outbreak. Four mild outbreaks were reported from the West Midlands. Incidence of fluctuating outbreaks was lower than in 1946.

In commercial tests the varieties OB 53, OM 26, OR 55, OJ 47, 1147, and 219 [ibid., 28, p. 241] maintained fair resistance on all sites, in many cases recovering from the effects of the disease in earlier years. OB 53 and OM 26 are the most resistant, but do not crop heavily at East Malling. Preliminary tests indicate that it may prove possible to distinguish between virulent and mild strains of the fungus by laboratory methods. Nutritional studies showed a striking correlation between incidence and intensity and nitrogen levels.

Split leaf blotch [ibid., 27, p. 43] was ascertained to be graft-transmissible. Two disorders of unknown origin were observed in many districts. In one, 'leaf curl', the leaves curled downwards, turned dark green with necrotic flecks, while the other was characterized by irregular 'oak leaf' chlorotic patterns on the leaves.

Several severe outbreaks of *Phytophthora* root rot [? *P. cactorum*: ibid., 25, p. 140] occurred in Worcestershire early in September, incidence ranging from 3 to 10 per cent. in the Mathon variety and up to 20 per cent. in certain Wye Seedling varieties, notably AEE 44 and Q 43 (Bullion).

KEYWORTH (W. G.) & HITCHCOCK (MARGARET M.). **Verticillium wilt of the Hop (Humulus lupulus). A note on the incidence of symptoms of fluctuating wilt in early, mid-season and late bine.**—*Rep. E. Malling Res. Sta., 1947*, pp. 148–149, 1948.

Some growers having reported that the number of hop plants affected by fluctuating wilt (*Verticillium albo-atrum*) [see preceding abstract] and the severity of the symptoms may be influenced by the 'forwardness' of the bine, treatments were made in 1945 to produce early, normal, and late bine. On one farm, of 307 plants subjected to late dressing (30th March) and training (16th May) 22 became affected, while of 327 given early dressing (21st February) and training (16th April) 51 were affected, the intermediate dates giving 33 out of 313; the corresponding figures for the numbers of plants with severe symptoms were 14, 29, and 19. The effect of the late treatment was to reduce the number of affected plants but not the severity of the symptoms. The results obtained on a second farm, though inconclusive, showed a similar trend.

KEYWORTH (W. G.). **Nettlehead disease of the Hop. A note on the reaction of certain Wye seedling varieties to graft infection.**—*Rep. E. Malling Res. Sta., 1947*, pp. 150–152, 1948.

The results of further grafting experiments performed in 1943 and 1944 with

18 Wye seedling hop varieties to test infection by nettlehead virus [*R.A.M.*, 26, p. 419; 27, p. 42 and next abstract] showed that, with the exception of Concord, at least one plant of every variety tested developed nettlehead during the year following grafting. In 1945, a further test was made, in which 30 non-clonal infected Fuggle plants (as used in the earlier experiment) were each inarched to a healthy Concord and a healthy Fuggle plant. The results demonstrated that Concord can show nettlehead symptoms, though they developed later than on Fuggle. The Concord plants were of good size with symptoms eventually appearing on laterals or near the tips of the bines, whereas the Fuggle plants were generally stunted. The cool conditions prevailing in 1946 encouraged the ready display of nettlehead symptoms. More extended field trials are to be conducted.

Keyworth (W. G.) & Hitchcock (Margaret M.). **Aerial surveys of the incidence of nettlehead disease of the Hop on former hedgerow and pasture sites.**—*Rep. E. Malling Res. Sta., 1947*, pp. 153–156, 2 pl., 2 maps, 1948.

During 1946, two aerial surveys (on 2nd July and 31st August) were made by the owners of a large hop farm [in Kent] on which outbreaks of nettlehead virus [see preceding abstract] occurred. In vertical photographs hop plants show dark against a light soil background. A progressively larger area of soil is obscured by each plant throughout the season, until in late August hardly any soil is visible in a photograph of a normal hop field. Groups of stunted plants or gaps can thus be detected as light-coloured areas, particularly towards the end of the season. A study of the photographs taken showed a preponderance of affected plants on the sites of old hedgerows in certain fields. In another field there were many more affected plants on a part that had once been old pasture than on a formerly arable section. There was no evidence as to the basic causes of these effects.

Claassen (C. E.), Schuster (M. L.), & Ray (W. W.). **New diseases observed in Nebraska on Safflower.**—*Plant Dis. Reptr*, 33, 2, pp. 73–75, 1949. [Mimeographed.]

Safflower rust (*Puccinia carthami*) [*R.A.M.*, 23, p. 40; 27, p. 541] was first observed in 1947 in Nebraska on greenhouse plants being developed for oil seed production. Adjacent experimental fields were severely affected the following year, most selections and introductions being susceptible. Some Rumanian and Turkish introductions were immune. Resistance to *P. carthami* appears to be dominant. A survey of commercial safflower fields in Nebraska, Colorado, North Dakota, and Montana revealed no infection on Indian safflower, although this variety is very susceptible in experimental plots. Traces of rust were found on Nebraska 852. The disease is probably spreading with the seed.

Since 1942, irrigated safflower plantings have suffered considerable damage during wet periods from a leaf spot, caused by a species of *Alternaria*. The disease is similar to that due to *Macrosporium carthami* [ibid., 25, p. 472]. Plantings made on dry land are usually not attacked. Some spineless lines from Yenice 1813 are very susceptible.

An undetermined root rot was first observed in a commercial planting in 1948. A phycomycete and species of *Fusarium* and *Alternaria* were commonly isolated from infected roots. All introductions from India and Africa are 50 to 100 per cent. susceptible, those from other countries appear to be highly resistant.

Summers (E. M.), Brandes (E. W.), & Rands (R. D.). **Mosaic of Sugarcane in the United States, with special reference to strains of the virus.**—*Tech. Bull. U.S. Dep. Agric.* 955, 124 pp., 12 figs., 11 graphs, 1 map, 1948.

This bulletin presents principally data from studies in Louisiana of strains of sugar-cane mosaic virus [cf. *R.A.M.*, 4, p. 124; 11, p. 265; 15, p. 52; 16, pp. 62, 125;

25, p. 81; 27, p. 98, *et passim*], their effect on different varieties of sugar-cane, and other phases of the disease. A comprehensive review of earlier work on the disease is given, together with tables recording the host range and the maximum incidence of mosaic on the numerous species and varieties exposed to natural infection at Houma, Louisiana, and Cairo, Georgia.

A study of local mosaic spread on experimental plots conducted over a period of years showed that wide variation occurred in the rate of spread between varieties and from year to year in the same variety. It is much greater to adjacent healthy plants in the same row than to those in adjoining rows 6 ft. away. Thus the movement of vectors responsible for secondary spread must be limited.

Extensive inoculation experiments have established the existence of a number of strains of the virus [ibid., 18, p. 621]. Strain A produces only ordinary mosaic or a rather irregular mottling type of chlorosis as in C.P. 31/294 and other seedling varieties. It has a very high index of infectivity. Strain B causes ordinary mosaic symptoms in Co. 281 and Louisiana Purple, and in C.P. 31/294 a rather general mottling, featured by severe chlorosis, a varying amount of necrosis, and conspicuous stunting. Strain C produces approximately identical symptoms in all varieties infected. These appear as isolated, often single, elongated, nearly white blotches or islands which coalesce or extend into long, yellowish-white streaks often running the whole length of the leaf. The streaks may follow the midrib, and are generally accompanied by necrosis, which often produces temporary blighting or death of the growing point. Little if any elongation of infected plants of C.P. 31/294 and other seedlings occurs and prodigious suckering is a common aftermath. This strain has a very low index of infectivity. Many seedling varieties highly susceptible to strains A and B appear to be immune or almost immune from C, or show only light transitory infection. Strain D produces ordinary mosaic symptoms in Co. 281 and Louisiana Purple, but in C.P. 31/294 symptoms are identical with those of C. It has a rather low index of infectivity, about half that of A and B, but considerably more than C. The slight differences between strains D, Da, Db, and Dc have already been noted [loc. cit.]. Strain E produces ordinary mosaic symptoms in Louisiana Purple and in occasional plants of Co. 281, which is strongly resistant. Germination recovery is common in Co. 281. The symptoms produced in C.P. 31/294 resemble at first those caused by strains C and D, but later are very different, in that they are fewer (often only one or two on a leaf), more clear-cut, and characteristically accompanied by marked reddening of the adjacent tissues. Though the macroscopic symptoms exhibited by C.P. 31/294 are much more severe than those due to strain D, no retardation of growth is apparent. This strain has a very low index of infectivity, comparable to that of C. Strain F produces very mild symptoms of a fine regular pattern on all varieties experimentally infected. They are readily distinguishable from the irregular, very positive patterns of A. Strain F is characteristically very slow to produce symptoms, as compared with A and B, and has a lower index of infectivity. All attempts to inoculate C.P. 807, from which strain F was originally obtained, with any strain failed. Strain G causes symptoms identical with those produced by B, except in C.P. 29/291, from which it was collected. In this variety it does not cause sheath discoloration or growth retardation, both of which are produced by the other strains. Strain G has an infectivity index appreciably lower than B but much higher than the D group. A key for the identification of the strains is given.

Surveys to ascertain the distribution of these strains in Louisiana and to some extent in other Southern States showed that B and D predominate in the sugar production area of Louisiana, none of the others being commonly collected on P.O.J. or Co. varieties. Strain E predominated in the rest of Louisiana, where sugar-cane is grown for syrup production, and in the adjoining States, where small areas of syrup varieties consisting chiefly of noble canes comprise the total acreage.

From present knowledge of the varietal associations of strains B, D, and E, and of the distribution of new sugar-cane varieties in the last 20 years it is tentatively concluded that those isolated fields which yield only strain E represent surviving remnants left from the original epidemic. Strain D spread with the distribution of the P.O.J. varieties from 1927 onwards. Strain B gained ascendancy from 1931 onwards and was responsible for heavy secondary spread.

Evidence is presented of the occurrence of permanent recovery, of the incidence of recovery in the more important commercial varieties, the variability of disease transmission by cuttings, and how a natural diminution and even a complete elimination of mosaic symptoms may take place over extensive areas as a result of recovery. Complete recovery, however, does not confer immunity. Very little recovery occurs in newly infected Co. 281 or P.O.J. 213.

Mrak (E. M.) & Phaff (H. J.). **Yeasts.**—*Ann. Rev. Microbiol.*, 2, pp. 1–46, 1948.

The authors review (with 234 references) the present state of knowledge concerning the phylogeny, morphology, taxonomy, and ecology of yeasts and related forms. The points dealt with include, *inter alia*, haploid and diploid generations, methods of study, genetics, identification, taxonomy, and (under ecology) yeasts occurring in substrates with a high sugar content, in fresh fruit, on meat products, in brines, in association with milk products, insects, and deteriorating wood and wood pulp, and as plant pathogens, yeasts from mushrooms, in soil, and in ocean water, and special fermentations involving yeasts.

Hendrickx (F. L.). **Sylloge fungorum congensium. Catalogue des champignons signalés au Congo belge et au Ruanda-Urundi.** [Sylloge fungorum congensium. A catalogue of fungi reported from the Belgian Congo and Ruanda-Urundi.]—*Publ. Inst. nat. Étud. agron. Congo belge*, Sér. sci., 35, 216 pp., 1948. Fr. 100.

This catalogue of fungi from the Belgian Congo and Ruanda-Urundi [cf. *R.A.M.*, 28, p. 31] is preceded by a list of new combinations and new names accepted in the catalogue. The main part of the work is arranged systematically, the genera and the species being listed alphabetically in their families. After the specific name, a reference to the original description is given, followed by reference to Saccardo's *Sylloge Fungorum*, synonyms or names under which the fungus was reported in any publication dealing with the Congolese flora, place where found, hosts or substrates on which it has been reported in the Congo where known, name of collector, number and date of collection, and any vernacular names and uses.

The author accepts the name *Hypoxylon deustum* (Hoffm. ex Fr.) Grev. in *Scot. Crypt. Fl.*, vi, tabl. 324, fig. 2, 1828 (syn. *Ustulina vulgaris*) [*R.A.M.*, 4, p. 68], and the form names *H. d.* f. *conidiophora* (Bres.) n. comb. and *H. d.* f. *madagascariensis* (P. Henn.) n. comb. are accepted for *U. v.* f. *conidiophora* and *U. v.* f. *madagascariensis*, respectively. The new combination *Mycosphaerella elaeidis* (Beeli) n. comb. is proposed for *Sphaerella elaeidis* [ibid., 9, p. 305].

An extensive bibliography and indexes to the vernacular names, families, and genera are appended.

Whitehead (M. D.), Thirumalachar (M. J.), & Dickson (J. G.). **Microascus trigonosporus from cereal and legume seeds.**—*Phytopathology*, 37, 12, pp. 968–973, 2 figs., 1948.

At the Wisconsin Agricultural Experiment Station a species of *Microascus* was isolated from surface-sterilized seed samples, ranging in age from a few months to 25 years, of Mammoth Yellow soy-beans from Alabama; barley from North and South Dakota, Michigan, Illinois, Minnesota, Iowa, and Wisconsin; Vicland oats from Wisconsin and Wyoming; and wheat from Wisconsin.

The conidiophores developing on potato dextrose agar were simple or branched and bore at the tips a single sterigma or verticil of sterigmata. The catenulate, ovate to lemon-shaped, smooth conidia measured 4 to 5·5 by 2·5 to 3·3 μ. The early stages of ascocarp development have been fully described by Emmons and Dodge (*Mycologia*, 23, pp. 313–331, 1931) and P. M. Jones [*R.A.M.*, 16, p. 386]. The yellowish-brown perithecia turned carbonaceous-black with advancing maturity. The beak of the well-developed ostiole ranged from a mere protuberance to an elongated neck, resembling the same structure in Curzi's *M. cirrosus* (*Boll. Staz. Pat. veg. Roma*, 10, pp. 302–310, 1930). The mature ascus was globose to spherical, with eight triangular to slightly crescentic, reddish-brown ascospores, 4·5 to 5·2 by 3 to 3·5 μ, which were discharged in long cirri united by a gelatinous matrix. In old drying cultures some of these spore tendrils were several millimetres in length and very conspicuous. The essential characters of the species resemble those of *M. trigonosporus* Emmons & Dodge, hitherto known only from the type locality (Puerto Rico), where it was isolated from a human skin infection.

Hyphae were located in the floral bract and pericarp tissues. The mycelium developed on the root surfaces and especially on the coleoptiles of germinating seedlings, penetrating the latter organs through the epidermis and becoming established in the tissues. The slender hyphae proliferated, both inter- and intracellularly, through the parenchyma, while the cortical tissue round the secondary roots was also invaded and permeated and small aggregates of hyphae appeared in the cortex adjacent to the stele. No definite necrosis or reduction of vigour resulted from the inoculation of cereal or soy-bean seedlings.

Barley and oat flowers were inoculated at anthesis through the floral bracts. The ripe grain showed no external evidence of infection, but after seven days at 20° C. colonies of *M. trigonosporus* had developed from all the kernels and floral bracts plated. Evidently, therefore, the fungus persists within the enveloping tissue in dormant seeds of several crop plants.

Thompson (A.). **'Blister blight' of Tea.**—*Malay. agric. J.*, 32, 1, pp. 25–27, 1949.

A brief, popular account is given of the symptoms, cause, and control of tea blister blight (*Exobasidium vexans*) [*R.A.M.*, 28, p. 34], not so far recorded from Malaya.

Hopkins (J. C. F.). **Field spraying and the control of leaf diseases of Tobacco. (Review report.)**—Reprinted from *Rhod. Fmr*, 2, 4–5, 1948 (*Plant Path. Pap. S. Rhod.* 1), 21 pp., 2 figs., 1948.

In this pamphlet the developments in fungicidal control of tobacco leaf diseases in Southern Rhodesia during the last 20 years are reviewed. In 1947–8 further spraying tests were carried out by the Agricultural Branch in co-operation with Messrs. Pest Control (C.A.) Ltd. [*R.A.M.*, 27, p. 199], using the same high-pressure equipment.

The results of the field work largely confirmed the tentative deductions made the previous season. Angular leaf spot (*Pseudomonas angulata*) was eliminated, but frog eye (*Cercospora nicotianae*) was again not controlled by spraying during a drought, early priming and the destruction of spotted leaves being more efficacious. Again a thorough spraying of seed-beds up to the time of transplanting, in order to raise disease-free seedlings, proved an important factor in frog-eye control. Clear evidence of the value of spraying in the control of *Alternaria longipes* was obtained. On farms where the disease has been destructive for years and where the weather favoured serious outbreaks the appearance of the disease was conspicuously delayed, thus allowing the leaf to ripen fully before harvest. Spraying did not control *A. longipes*, however, on over-ripe leaf. Inoculation experiments showed that *A. longipes* can attack very young plants although the fungus becomes active

only when the plant matures. Primary infections may easily be mistaken for frog-eye spots. Spraying, to be effective, should begin when the plants are young.

It is concluded that field spraying with the machines and fungicides at present used in Southern Rhodesia though clearly beneficial is not completely effective against tobacco leaf diseases unless strict field hygiene is also practised. It would, however, appear to be financially sound on farms where the disease causes heavy losses. If more suitable machines and more efficient fungicides with better adhesive properties can be developed, field spraying may replace the present hand methods and may bring about a general reduction of infection.

McEvoy (E. T.). **Construction and management of Tobacco seed-beds.**—*Fmrs' Bull. Canad. Dep. Agric.* 148, 25 pp., 19 figs., 1948.

This paper presents valuable information to tobacco growers on the construction and management of seed-beds and contains a chapter on seed-bed diseases (pp. 23–25). These include (1) damping-off caused by parasitic soil-borne fungi [*R.A.M.* 23, p. 461], which can be controlled effectively by sprinkling the bed with a fermate solution (½ lb. in 40 gals. water) at the rate of 40 gals. per 100 sq. yds. or by disinfecting the soil with formalin (1 gal. in 50 gals. water); (2) blue mould [*Peronospora tabacina*: ibid., 27, p. 175], for which dusting with fermate or with bismuth subsalicylate is recommended as a preventive measure and for control, repeated applications of PDB (paradichlorobenzene) crystals [cf. ibid., 27, p. 72] at 2 to 3 lb. per 100 sq. yds. to the cotton covers of beds, or raising the temperature to about 105° to 110° F. for 5 hours weekly; and (3) the physiological disorder yellow patch [ibid., 19, p. 122].

Wilson (J. D.) & Runnels (H. A.). **Losses from Tomato fruit rot can be reduced.**—*Food Packer*, 30, 3, pp. 44, 46, 1949.

Of the fungicides now available on the market, zerlate has proved to be the most effective for the control of tomato anthracnose [*Colletotrichum phomoides*: *R.A.M.*, 28, p. 36] at the Ohio Agricultural Experiment Station. It is best applied as a spray (2 in 100 at 150 to 200 gals. per acre), but may also be used as a 10 per cent. dust at 40 to 50 lb. per acre. The initial treatment should be given about 30 days (never more than 35) after the first cluster blooms, and three, or preferably four, further applications made at 10- to 12-day intervals. An alternating schedule of zerlate and a fixed copper or Bordeaux mixture has also given excellent results, particularly when blight [*Phytophthora infestans*] is present, against which zerlate is only moderately efficacious. The performance of zerlate is still further improved by the addition of an adjuvant, such as orthol-K or Du Pont spray adhesive.

Anthracnose has frequently been observed to cause more trouble on light sandy soils than on the heavier types. The disease is also becoming more prevalent in experimental areas and gardens planted with tomatoes every year, and quadrennial crop rotation should therefore be practised. Contact between the fruits and the soil greatly increases the incidence of infection by *C. phomoides*, which may be reduced by growing the plants inside a trellis consisting of three wire hooks held in position by four supporting wires. In 1947 and 1948 this contrivance held nearly all the fruits of several hundred plants at least a few inches off the ground. At the same time other plants were grown in the usual way on the ground in adjacent rows. Half of each lot was sprayed with zerlate and the following percentages of infection developed: at Wooster in the trellis, unsprayed and sprayed, 0·9 and 0·2 and on the ground 19·8 and 7·6, respectively; at Fremont in the trellis 4·1 and 2·2 and on the ground 29·3 and 10, respectively. However, since most of the tomatoes cultivated for commercial purposes must still be grown on the ground, the elimination of the pathogen from a thin layer of soil by means of an eradicant spray would be

very helpful. Of the many compounds tested during the past three years, only two combine partial efficiency with absence of phytotoxic properties.

No true resistance to the disease emerged from large-scale plantings of established varieties and new hybrids on heavily contaminated soil, but wide variations in susceptibility were observed. Among the standard canning varieties, Stokesdale and Baltimore proved somewhat less susceptible than Garden State and Rutgers, while a comparatively high degree of tolerance was manifested by various new lines tested in 1948. Only 1 to 5 per cent. of the fruits of the latter contracted infection compared with a loss of 20 to 25 per cent. in varieties of the Rutgers and Ontario type.

To determine in 14 varieties now in use the liability to anthracnose after harvesting, a new kind of experiment was designed. All cull fruits were discarded during the first grading operation and the remainder placed in standard tomato hampers and transferred to an open shed (to simulate a cannery dock). After two days the fruits were again examined for anthracnose and the culls discarded, and a final count of infection was made at the end of four days. Most of the varieties developed as much anthracnose during the four-day post-harvest period as they had shown at the time of picking. The percentages for six were as follows: Garden State at picking 16, after two days 25, and after four days 34·2; Rutgers 20·6, 26·8, and 33, respectively; Stokesdale 10, 16·5, and 22·5; Baltimore 10·7, 15·3, and 20; CRLM2-H (Regional Vegetable Breeding Laboratory, Charleston, South Carolina) 2·2, 4·3, and 6·9; and Heinz 8–6–4 1·4, 2·3, and 3·5. To the grower an initial infection of 20 per cent. means that a potential yield of 15 tons per acre is reduced to 12 by anthracnose alone, but the canner may easily sustain an equivalent loss if the disease was severe at harvesting and he holds the tomatoes more than a day or two after delivery at his factory. In this connexion it is of interest to note that the spraying of Rutgers with zerlate at ten-day intervals reduced the initial and final loss from anthracnose by about 80 per cent. On this basis a disease control programme should easily pay for itself through an increase in the yield and quality of both the raw and processed products.

Camici (Leontina). **La 'mummificazione delle Castagne' da Phomopsis viterbensis sp. n.** [Mummification of Chestnuts caused by *Phomopsis viterbensis* n. sp.]—*Ann. Sper. agr.*, N.S., 2, 4, pp. 557–566, 8 figs., 1948. [English summary.]

During the winter of 1947, a consignment of chestnuts from Viterbo contained nuts flaccid to the touch; inside, the seed was rather small, and the surface wrinkled, dry, and hard. The cotyledons were covered with a thin white pellicle of mycelium. The pulp was lime-white and after exposure to the air became creamy-grey; it emitted a faint odour of yeast, was much harder than normal and had a fibrous-plastery appearance. Finally, it became shrivelled and hard, with cracks and cavities inside. The starch parenchyma was completely invaded by a weft of inter- and intracellular hyphae.

On carrot agar at 25° C. the fungus formed greyish-white colonies which gradually became yellow and had concentric zones of flocculent and submerged mycelium. Some hyphae were 2 to 3 μ in diameter, hyaline, sparsely branched, sinuous, and occasionally in balls, others were sinuous, about 5 μ in diameter, with conspicuous septa, granular contents, and branches at an acute angle. Old cultures contained hyphae with globose-vesicular elements measuring 11 to 15 by 8 to 15 μ. On all media used the growth rate at 25° was 7 to 8 mm. in 24 hours.

After 15 to 20 days on carrot agar, round black bodies about 500 μ in diameter appeared on the surface of the culture, sometimes surmounted by a mucous, shining drop. In cultures one to two months old they were greyish-white, bore a brown mucous drop, had a cheesy consistency, were about 1 mm. high and $\frac{1}{2}$ to $1\frac{1}{2}$ mm. across, and were of a truncated cone shape. These bodies were single

pycnidia or aggregated pycnidia immersed in a stroma. A short basal foot of pseudo-parenchymatous structure, covered with greyish, loose mycelium, elevated the shining black heads. They contained one or more confluent, irregular cavities, with a pore through which pycnidiospores and mucilage were emitted.

The phialiform, tufted conidiophores were simple or once-branched, measured 7 to 8 μ long by 3·5 μ wide in the broadest part, and tapered towards the rounded apex bearing the pycnidiospores. Some, more numerous, were filiform, hyaline, continuous, and vermiculate or crook-shaped, and measured 12 to 28 by 1·5 to 2·5 μ; others were ellipsoidal, biguttulate, continuous, rounded at both ends, and measured 4 to 7·5 by 2·7 to 3·5 μ. Both types occurred in the same pycnidium and were borne on similar conidiophores.

In view of these characters, and, in particular, the presence of the filiform pycnidiospores, the fungus is regarded as a new species of *Phomopsis*, and is named *P. viterbensis* n. sp.

Experimental inoculations of chestnut fruits reproduced the disease, the fungus being re-isolated from the infected material. The evidence indicated that the disease is favoured by high temperatures. The fungus probably enters after harvesting through a crack in the pericarp at the apex of the fruit and sets up infection during storage. Control consists in improving the storage conditions.

Castellani (E.). **Ricerche morfo-bio-ecologiche sulla 'Gnomonia juglandis' (DC.) Trav.** [Morphological-biological-ecological studies on *Gnomonia juglandis* (DC.) Trav.]—Reprinted from *Ann. Accad. Agric. Torino*, 90, 19 pp., 1 fig., 1948.

Studies on the life cycle of *Gnomonia juglandis* [*G. leptostyla*: *R.A.M.*, 3, p. 197; 28, p. 38] on walnut in Italy during the autumn-winter months were carried out for more than two years in the neighbourhood of Montepiano, Florence. At the end of the summer the parasite produced numerous conidial fructifications which gradually reached maturity during November, some on the fallen leaves. Among the normal conidia in the acervuli formed at this time were some that were atypical and more slender; the possibility of their having a sexual function cannot be ignored.

The differentiation of the first outlines of the perithecia occurred gradually from the beginning of October onwards, the successive stages of development varying for each perithecium according to the time of its formation. The first receptacles, well differentiated externally, were observed after mid-December. The differentiation and maturation of the ascospores began at the end of December, being completed mostly after the second half of March. They matured earlier or later than this according to the autumn-winter temperature. The expulsion of the ascospores was preceded by lysis of the walls of the asci, and was induced by an accumulation of mucilaginous substances in the perithecium and a further increase in their volume by water absorption. Ascospore expulsion extended over a rather long period (April to May), corresponding to the time of maximum vegetative activity in the host. The primary infections took place on the opening buds. The first mature acervuli began to appear in the second fortnight in May. Summer rains were an important means of spreading the disease.

Control should be directed primarily against the overwintering forms. The results of preliminary experiments in this direction are given.

Ter Pelkwijk (A. J.) & Brink (G.). **Verslag van het onderzoek 1943–1945 en 1946 naar den Populieren-kanker.** [Report on the investigations on Poplar canker 1943–1946.]—*Meded. ned. Heidemaatsch.* 2, 21 pp., 6 figs., 2 graphs, 1946. [English summary.]

Investigations into poplar canker [*R.A.M.*, 26, p. 221] carried out in Holland

during 1943–6 showed that although several species of bacteria were isolated from the slimy exudates, none caused the typical swellings. Only *Pseudomonas rimaefaciens* was strongly infective, causing some withering above the inoculated parts and fissures with smooth margins. Inoculations with various bacterial combinations, as well as with bacteria and fungi, failed to induce typical cankers.

It is suggested that a close connexion exists between the period of greatest susceptibility in spring and temperature. After severe winters the trees were most susceptible in May and June, after mild ones the susceptible period was in March and April. Of the many poplar varieties tested since 1938 (especially in 1943, 1944, and 1945) only *Populus nigra* and its varieties were found to be resistant. Among the moderately resistant were *P. trichocarpa*, *P. tristis*, *P. rasumowskiana*, *P. berolinensis*, *P. gelrica*, *P. serotina erecta* B 20, Henry B 34, and Henry B 12, *P.* '*caroliniano prodigioso*' B 41, and *P.* '*ibrido italiano* A.M.' B 42.

Soil acidity and nitrogen manuring had no effect on canker formation. At first trees on acid plots were more seriously affected, but those on alkaline soils soon showed a similar rate of infection. The alder beetle *Cryptorrhynchus lapathi* which was commonly found on the susceptible *P. candicans* is a suspected vector of the disease.

In 1944, the experimental four- to five-year-old *P. robusta*, *P. angulata erecta*, *P. simonii fastigiata*, *P. berolinensis*, *P. gelrica*, and *P. marilandica* trees and a number of freshly transplanted seedlings were severely attacked by *Dothichiza populea* [ibid., 26, p. 431], the development of the fungus being favoured by frost in May. In 1946 the fungus again caused much damage, attacking, in addition to the varieties mentioned, *P. deltoides missouriensis* and *P. nigra italica*.

Nattrass (R. M.). **A Botrytis disease of Eucalyptus in Kenya.**—*Emp. For. Rev.*, 28, 1, pp. 60–61, 3 pls., 1949.

The leaves of *Eucalyptus globulus* in Kenya, attacked by *Botrytis* sp. [*R.A.M.*, 27, p. 312] in 1946 during an exceptionally wet season, bore lesions varying from small, diffuse spots, apparently growing inward from the leaf margin or tip, to large, light brown areas involving the complete lateral half or the whole of the leaf. Cankers occurred on branches and leaders where diseased leaf tissue joined the stems. Many of the girdled leaders were broken at the canker and hung downwards.

In culture the fungus appeared to be indistinguishable from *B. cinerea* [see above, p. 258]. Young, severed shoots of *E. globulus* readily became infected when cuts were inoculated with a piece of an agar culture of *B. cinerea* from another source. Three days after the young leaves of similar shoots in a moist atmosphere had been infected with a conidial suspension after removal of the waxy bloom, several small, round, sunken spots appeared and later coalesced, causing a general rot of the leaf tissue, stem, and apical bud after seven days. Sclerotia later developed on both surfaces of the leaves and on the stem epidermis. By 1948 the effects had completely disappeared from the original trees.

Kennedy (D. E.) & Wakefield (W. E.). **The strength of Jack Pine poles infected with pocket rot.**—*Circ. For. Serv. Can.* 65, 22 pp., 9 figs., 2 graphs, 1948.

Investigations at the Forest Products Laboratories, Ottawa, into the strength of green and air-dry jack pine (*Pinus banksiana*) poles infected with *Fomes pini* [*R.A.M.*, 26, p. 567], the causal organism of pocket rot in jack pine, showed that those which have been seasoned and then thoroughly saturated with water tend to be weaker than green poles. Poles with less than 20 per cent. pocket rot were practically as strong as healthy ones; those containing 21 to 45 per cent. at the ground-line could be used in pole line construction if appropriate reductions in working stresses were made.

Sproull (R. C.). **Preserved poles for tomorrow.**—*Elect. Light Pwr*, 26, 10, pp. 64–69, 140, 1 fig., 1948.

The available information on the preservation of poles for the public utility services, railways, and communications in the United States is examined and discussed. Tables are reproduced from *Proc. Amer. Wood Pres. Ass.*, 43, 1947 [cf. *R.A.M.*, 28, p. 149], showing (I) preservatives used in United States 1944–46, (II) materials treated in United States 1944–5, (III) U.S. production of synthetic organic chemicals for 1946 and early months of 1947, (IV) sources of less widely used preservatives, (V) estimated need of preservative per year 1950–55 compared with 1944–46 uses, and (VI) comparison of requirements of creosote oil and production. Reference is also made to a number of other important contributions to the literature on the subject.

It is concluded that, assuming the continuance of the trend of usage up to the present, the demand for creosote as a preservative during the period from 1950 to 1955 will exceed the supply by upwards of 70,000,000 gals. Among the preservatives that have given promising results in tests of shorter service than creosote are copper ammonium arsenite, copper arsenite, pentachlorophenol, copper naphthenate, copper meta-arsenate, and chromated zinc chloride. A large consumer can be assured of a supply of treated poles by (1) the selection of two or more preservatives derived from two independent raw materials, e.g., creosote oil and chlorinated phenol from coal, copper naphthenate from petroleum, and copper-arsenic or zinc-chromium compounds from ores; (2) a knowledge of the service requirements of the wood and choice of the most appropriate preservatives for the purpose; (3) selective treatment to ensure the maximum concentration of preservative where needed and its reduction elsewhere; and (4) the encouragement of research for new preservatives and for better and cheaper methods, as well as the more adequate utilization of compounds of established value.

Harrow (K. M.). **Methods of evaluating pressure systems for timber preservation with aqueous solutions absorption.**—*N.Z. J. Sci. Tech.*, B, 29, 3, pp. 156–163, 3 graphs, 1947. [Received January, 1949.]

The damage caused to building timber by wood-destroying fungi in New Zealand is negligible, and is usually associated with faults in construction. However, preservative treatment is necessary to protect timber from insects. Suitable pressure impregnating systems are described [see next abstract] and methods used to measure absorption discussed.

Harrow (K. M.). **An experimental pressure plant for timber preservation research.**—*N.Z. J. Sci. Tech.*, B, 29, 3, pp. 153–155, 1 fig., 1 graph, 1947. [Received January, 1949.]

In connexion with investigations into methods of timber impregnation [see preceding abstract] at the Plant Diseases Division, Auckland, a pressure plant has been installed; a brief description of the structure and its mode of operation is given.

Schøyen (T. H.) & Jørstad (I.). **Skadedyr og sykdommer på grønnsakvekstene.** [Pests and diseases on vegetables.]—142 pp., 22 col. pls., 17 figs., Oslo, H. Aschehoug & Co., 1949.

This useful manual contains simple descriptions of the symptoms and other pertinent information relating to the pests and diseases of plants in general, cucurbits, beets, beans [*Phaseolus vulgaris*], peas, carrots, crucifers, onions and leeks, parsnips and parsley, lettuce, celery, spinach, and tomatoes in Norway, with directions for their control; general recommendations for spraying and dusting, soil sterilization by means of steam and chemicals, greenhouse fumigation, seed

treatment, and other sanitary practices; and a key for the identification of pests and diseases.

DALE (W. T.). **Observations on a virus disease of certain crucifers in Trinidad.**—*Ann. appl. Biol.*, 35, 4, pp. 598–604, 1 pl., 1948.

Indian mustard (*Brassica juncea*), *B. chinensis*, and an eastern variety of radish (probably *Raphanus sativus* var. *hortensis*) in Trinidad sometimes suffer slight losses from a mosaic disease, readily transmitted by mechanical inoculation and by the aphis *Rhopalosiphum pseudobrassicae* [*R.A.M.*, 28, p. 291], which is probably responsible for the spread in the field. Over 90 per cent. of inoculated Indian mustard plants, after 5 to 14 days, developed a light and dark green mottling and blistering of the leaves, which was sometimes preceded by a localized, indistinct vein-clearing. Subsequently pale green leaves with irregular darker patches developed. Plants infected at an early stage exhibited severe stunting, especially those grown in the greenhouse. The other hosts showed similar symptoms.

Rape (*B. napus*), turnip, other kinds of Chinese cabbage (*B. pekinensis*), *Zinnia elegans*, tobacco, and *Lepidium virginicum* proved to be susceptible, while cabbage, cauliflower, kohlrabi, and the European radish appeared to be immune. All the susceptible hosts showed a systemic mottling except tobacco, which reacted with necrotic local lesions.

The thermal inactivation-point of the virus is 58° C., the dilution end-point 1 to 1,000, and the longevity *in vitro* four days at 16° to 18° and three days at 24° to 30°. The virus closely resembles some of the strains ascribed to the turnip virus 1 group [turnip mosaic virus: ibid., 14, p. 731; 28, p. 43], but is considered to be distinct.

BASKETT (R. S.) & SCOTT (C. E.). **Corral spot effect on Beans in California.**—*Plant Dis. Reptr*, 33, 2, pp. 93–94, 1949. [Mimeographed.]

Zinc deficiency symptoms were observed in August, 1948, on Red Kidney beans [*Phaseolus vulgaris*] growing on an old corral site in a field in the San Joaquin County, California, while the plants in the rest of the field were normal. The affected plants were stunted, the foliage showed interveinal chlorosis, and very few pods had set. The young leaflets were crinkled or ruffled, and abnormally narrow. Spraying with 2 lb. zinc sulphate plus 1 lb. hydrated lime in 50 gals. water corrected the condition.

TIMNICK (MARGARET B.), LILLY (V. G.), & BARNETT (H. L.). **The influence of light and other factors upon the sporulation of Diaporthe phaseoli from Soy Bean.**—Abs. in *Amer. J. Bot.*, 35, 10, p. 804, 1948.

The production of perithecia, asci, and ascospores by *Diaporthe phaseoli* [*D. phaseolorum* var. *sojae*: *R.A.M.*, 28, p. 107] from soy-bean is influenced by the medium used and by exposure to ultra-violet and visible light. On vegetable juice agar pycnidia but no perithecia are formed. Few perithecia form on vitamin-free casein hydrolysate medium unless the cultures are irradiated with ultraviolet light, but on various natural media this treatment scarcely affects sporulation. Exposure of cultures to continuous illumination from a daylight fluorescent tube for 60 days allows the development of abundant perithecia, but almost completely inhibits the formation of asci and ascospores.

NYSTERAKIS (F.). **Dégénérescence de la Vigne. Une mise au point.** [Degeneration of the Vine. A summing-up.]—*Vitic. Arboric., Paris* (formerly *Rev. Vitic., Paris*), 94, 8, pp. 240–245, 3 figs., 1948.

In answer to the view expressed by Branas that vine court-noué is probably due to a virus transmitted by *Phylloxera* [*vastatrix* f. *radicicola*: *R.A.M.*, 27, pp. 439,

528; 28, p. 207 and next abstracts] the author recapitulates the evidence he previously adduced in support of his opinion that it is caused by hormone disturbance, in some cases possibly due to a virus, but that the insect in question plays no part in transmission.

Raphael (A.). **La dégénérescence de la Vigne ou court-noué pourrait-elle être attribuée à une action cellulolytique, dans laquelle le cuivre, en milieu ammoniacal ou aminé, constituerait l'élément actif?** [Could Vine degeneration or court-noué be attributed to a cellulolytic action in which copper in an ammoniacal or aminated solution constituted the active element?]—*Vitic. Arboric., Paris* (formerly *Rev. Vitic., Paris*), 94, 9, pp. 273–276, 4 figs., 1948.

The author adduces reasons, based on chemical grounds, in support of the view that court-noué disease of the vine [see preceding and next abstracts], at least in most of its manifestations, may be due to cellulolysis induced by the presence in the tissues of a copper complex in ammoniacal or amine solution [cf. *R.A.M.*, 26, p. 284; 27, p. 408].

Garrigues (E.). **Sur le court-noué de la Vigne.** [Vine court-noué.]—*Vitic. Arboric., Paris* (formerly *Rev. Vitic., Paris*), 94, 12, pp. 357–358, 2 figs., 1948.

A few years ago the author attempted to revive an abandoned Aramons vine on Rupestris stock, severely affected by court-noué [see preceding and next abstracts] growing on a dry calcareous clay slope at Aniane, Hérault, by the application of organic manure, judicious pruning, and the application of 250 gm. potassium chloride per vine.

The results were very encouraging. The yield for 4,500 vines (1 ha.) in 1946, 1947, and 1948 was 50, 95, and 170 baskets, respectively. In 1948 in particular the grapes were very large, normally formed, matured regularly with no dropping. The branches were well ripened and there was no browning. The wine had a 9 per cent. alcohol content. If similar results are obtained in other localities, this treatment would merit tests on a larger scale.

Couderc (V.). **Viticulture en sols court-nouants. Rôle de la végétation spontanée.** [Vine-growing in soils giving rise to court-noué. Part played by wild vegetation.]—*Vitic. Arboric., Paris* (formerly *Rev. Vitic., Paris*), 94, 12, p. 359, 1948.

The author describes the beneficial action of wild perennial plants in draining, aerating, and fertilizing soils on which vine court-noué [see preceding abstracts] is prevalent. Fertilization is effected directly by converting the nutrient elements into organic compounds and distributing them evenly in the soil and subsoil, and indirectly by modifying the number of micro-organisms in the soil.

Benlloch (M.). **Los síntomas del mildiu y la pasada primavera.** [Mildew symptoms and the past spring.]—*Agricultura, Madr.*, 17, 195, pp. 301–303, 6 figs., 1948.

The course of a vine downy mildew [*Plasmopara viticola*] epidemic in Spain in 1948 is traced in relation to the weather during the spring. The disease is not endemic in the provinces involved (Centro, Mancha, and Estremadura) and the author's object is to familiarize growers with the symptoms associated with various meteorological conditions, so that they may be promptly recognized and the appropriate control measures taken.

Matthews (R. E. F.). **Criteria of relationship between plant virus strains.**—*Nature, Lond.*, 163, 4135, p. 175, 1949.

When *Datura tatula* and tobacco plants were inoculated with six mottle and four ring spot type strains of potato virus X [*R.A.M.*, 27, p. 577], it was found

that four of the mottle strains gave complete protection against all the ring spot strains. Two of the mottle strains, B [ibid., 23, p. 403] and TBRX [*Parasitology*, 27, p. 126, 1946], allowed necrotic local lesions and systemic necrosis to develop following inoculation with any of the ring spot strains used, although the symptoms were not as severe as when the ring spot strains were used alone. These two strains both had a strain-specific antigenic fraction and also shared a fraction not possessed by any of the other strains tested.

Six of the strains proved indistinguishable when examined by the serological cross-absorption technique. A symptomless strain and a ring spot type isolated from Salaman's X^h culture [ibid., 18, p. 129], both isolated from the same potato plant, were serologically indistinguishable, but possessed an antigenic fraction not possessed by any of the other eight strains.

Thus, in the ten strains tested, a correlation was established between serological relationship and the degree of protection afforded in the host plant.

Report of Proceedings, Fourth International Congress for Microbiology, Copenhagen, 1947.—649 pp., Copenhagen, Rosenkilde and Bagger, 1949. 40 Kr.

Among the many interesting papers communicated to the Congress [cf. *R.A.M.*, 19, p. 554] the following may be mentioned.

F. C. Bawden (p. 58) discusses some biological implications and limitations of recent work on the nature of plant viruses and attempts to reconcile the divergent hypotheses of their origin. Having defined a virus as an invisible pathogen the author points out that the chemical uniformity characterizing virus proteins after isolation may not prove to hold for all plant viruses. The isolated nucleoprotein may be regarded as no more than the chemical minimum that is required to alter the metabolic processes of a susceptible cell. Owing to its capacity for combining with a variety of substances its chemical simplicity will be lost before it starts to function as a virus. The consequences of purification are discussed. It is suggested that there are virus infections of such low concentration that they will remain undetected until far more delicate methods for investigating them have been evolved. Caution is needed in interpreting tests for homogeneity; preparations apparently pure and homogeneous may in part lose their infectivity, indeed even the most infective preparations may be mixtures of infective and non-infective components. After discussing the relation between particle size, aggregation, and infectivity the author concludes that the conception of viruses as parts of larger dynamic systems will prove, in his opinion, more profitable than their treatment as self-sufficient entities, whether as organisms or molecules.

S. A. Waksman (p. 71) deals with the nature and formation of antibiotics, their utilization for disease control and mode of action upon bacteria, the development of resistance in bacteria to antibiotics, and the importance of antibiotics in natural processes, especially their contribution to the survival of micro-organisms in a natural environment.

O. Winge (p. 83) describes the part played by yeast in modern genetics.

G. Lindeberg (p. 401) describing further investigations into the capability of various soil-inhabiting Hymenomycetes growing on litter to decompose lignin and cellulose [ibid., 24, p. 472] stated that of 46 species examined 44 decomposed both substances to about an equal extent (often more than 50 per cent.). In two experiments, however, *Clavaria gracilis* cultivated on beech leaves decomposed lignin only (up to 53 per cent.) while *Collybia butyracea* grown on the same substratum decomposed 77 per cent. of the lignin, but only 16 per cent. of the cellulose. In the genera *Clitocybe*, *Marasmius* [loc. cit.], and *Clavaria* some other species were found which decomposed more than twice as much lignin as cellulose.

G. Goidànich (p. 399) states that the fungus flora of wood pulp consists of a number of species which can be considered as a constant 'ecological group', regard-

less of the original raw material. Of Fungi Imperfecti which form the greatest part of the mycoflora, the following genera occur most commonly: *Phialophora, Scopularia, Trichoderma, Penicillium, Hormodendron, Fusarium, Alternaria,* and *Graphium.* Basidiomycetes are mainly represented by *Pholiota, Paxillus, Clitocybe, Polyporus, Stereum, Poria, Lenzites,* and *Polystictus,* Phycomycetes by *Pythium* and *Rhizopus,* and yeast-like fungi by *Geotrichum, Geotrichoides, Mycotoruloides, Rhodotorula,* and *Torulopsis.*

E. Rennerfelt (p. 403) states that under certain conditions wet mechanical pulp is subject to attacks by blueing fungi (most commonly *Pullularia pullulans* and *Phialophora fastigiata*) [ibid., 28, p. 98], decay fungi, moulds (*Aspergillus, Penicillium,* and *Trichoderma* spp.), and yeast-like fungi which may constitute often up to 90 per cent. of the spores found in fresh pulp. The most dangerous source of infection is in the fibre suspension of the white water passing through the mill, which favours particularly the development of the Torulopsideae. Their increase is counteracted, on the other hand, by the relatively high temperature of the fibre suspension (40° to 45° C.). During storage the yeast-like fungi increase to a much lesser extent than the other groups. Frozen pulp is especially susceptible to the attacks of blueing fungi during the thawing period.

Primary infection can be reduced by general hygiene in the mills and careful cleaning of pipes and vats. Good ventilation and isolation of the mills prevent the growth of moulds and blueing fungi on the walls and ceilings. Effective control was obtained with organic mercury compounds and certain chlorophenols, either by adding to the pulp with the aid of a roller on the chamyr machine, or by mixing them with the white water.

B. A. Kvíčala (p. 413) states that *Myzus ornatus* fed on cauliflower plants infected with mosaic [ibid., 28, p. 262] transmitted to healthy seedlings *Brassica* virus 3 [cauliflower mosaic virus]. *M. persicae* and *Brevicoryne brassicae* transmitted from the same infected plants what is considered to be a virus complex, consisting of cauliflower mosaic virus and *Brassica* virus 1 [cabbage black ring spot virus]. This was confirmed by inoculation tests with White Burley tobacco. *M. ornatus* was the most efficient vector of the mosaic virus and *B. brassicae* of the ring spot virus.

H. M. Quanjer, A. Rozendaal, and T. H. Thung (p. 417) recommend a classification of tobacco and potato viruses based on premunity studies. The tobacco viruses are arranged into two groups: A, containing those transmissible by plant extract, and B, those transmitted by aphids but not by sap. Group A is subdivided into mosaic (A) and necrosis (An) sub-groups. The An viruses cause only necrotic symptoms in the test variety and have a higher premunizing power. Tobacco mosaic virus, which most markedly premunizes the tobacco plant against all other viruses of the same sub-group, is classified as No. AI and is followed by the others in decreasing order of premunizing power. Those in the necrotic subgroup are arranged similarly. Group B is subdivided into those which are transmissible by *Bemisia* (Bb) and by *Myzus persicae* (Bm). The viruses with the same premunizing power within the sub-groups are differentiated by small letters.

The potato viruses occurring in Holland are arranged in five groups, (1) X-viruses, (2) A-viruses, (3) Y-viruses, (4) F-viruses, and (5) leaf roll viruses. Each virus premunizes the host from other viruses of the same group, but not from those of another.

G. Segretain (p. 419) describes studies on the action of urea on [tobacco] tissue cultures infected with tobacco mosaic virus [ibid., 28, p. 250]. Concentrations of 1 and 2·5 gm. mol. per l. caused the tissues to turn brown and develop no further after a few days. After 15 days the virus was completely inactivated. At 0·2 and 0·5 gm. mol. per l. necrosis began and virus titre diminished after 15 days, while at 0·1 the tissues were still quite green and were growing normally after the same

period, the virulence of the sap being similar to that of the control. After a month, however, the tissue fragments turned brown. It is concluded that at concentrations at which urea inactivates the virus it is too toxic for the plant tissues.

W. J. Dowson (p. 423), after discussing the taxonomy and nomenclature of the plant pathogenic bacteria, rejects the inclusion of the crown gall [*Bacterium tumefaciens*] and hairy root [*Bact. rhizogenes*] pathogens in the genus *Agrobacterium* in the family Rhizobiaceae [ibid., 27, p. 512; 28, p. 273]. Both ferment salicin and other carbon compounds which *Rhizobium* does not. The following recommendations were put to the Congress: (1) that *Bacterium* Ehrenberg 1828 be designated a nomen conservandum, (2) that the type species of *Bacterium* be designated *Bacterium coli* Escherich, 1885, and (3) that the genus *Bacterium* be so defined as to include the Gram-negative, non-sporing, peritrichous plant pathogens.

S. E. Jacobs (p. 425) states that on the basis of disease symptoms *Corynebacterium fascians* [ibid., 28, p. 274] differs sharply from other members of the genus [ibid., 22, p. 345]. It differs also in lipolytic activity and growth factor requirements. There is a relationship with the gall- and nodule-forming bacteria [ibid., 25, p. 292], as both these and *C. fascians* act on preformed structures (dormant buds and root primordia), cause dwarfing, and do not require wounds to start infection. They all evidently have the property of altering the normal hormone balance in the host. *Bact. tumefaciens*, *R. trifolii*, and *C. fascians* all form β-indolylacetic acid in culture, and are capable of utilizing carbohydrates without marked acid production. The morphology of *Rhizobium* cells corresponds with that of the genus *Corynebacterium*. It is suggested that the relationship between these organisms should be expressed in their classification.

An analysis by A. J. P. Oort (p. 432) of Straib's investigations [ibid., 16, p. 372; 17, p. 231; 19, p. 76] revealed that out of the 32 races of *Puccinia glumarum* occurring in Europe, 16 have been collected only a few times in restricted areas while 16 are more or less widespread. The latter may be divided in three groups, (A) races 2, 3, 4, and 16, found everywhere from England to Turkey with the exception of Scandinavia and Finland; (B) races 5, 6, 7, 8, 14, 15, and 41, found commonly in England, Holland, Scandinavia, Finland, and Germany; (C) races 18, 19, 20, 25, and 35, found in Hungary, Bulgaria, and Turkey. Some races have sharp boundaries, probably due to the temperature requirements of the parasite; those of group (B), for example, occur frequently in Holland and Germany, but not in Belgium or France. Another sharp boundary, that between groups (B) and (C), lies between Austria–Czechoslovakia and Bulgaria.

The differential host reactions to races 5, 6, 7, 8, and 41 are remarkably uniform, with the exception of Webster and Carstens V. Races 2, 3, and 4 are also very alike and differ only in their reaction on Spaldings Prolific and Rouge Prolifique Barbu, while 18, 19, 20, and 25 differ only on Webster and Heines Kolben. Breeding may be much simplified if the uniformity of these sub-groups is recognized. Thus, for France and Belgium, only two sub-groups of (A) have to be taken into account, and for England and Holland four of groups (A) and (B).

H. Robak (p. 434) states that spore measurements and differences in culture characters and the growth of germ mycelia of the parasitic and saprophytic species of *Dasyscypha* on larch supported the finding that they belong to distinct species [ibid., 23, p. 50]. However, mycelia of both types grew easily on dead, sterilized larch twigs in a moisture-saturated atmosphere, and inoculations of healthy larch branches with pieces of bark from fresh cankers and infected dead twigs induced in both cases incipient or typical cankers.

The quantity of available copper in a nutrient medium or in soils can be determined, according to E. G. Mulder (p. 489), by the colour of *Aspergillus niger* spores. Thus, in a copper-free medium the fungus develops a white mycelium without spores; with 0·2, 0·4, 1, 1·5 and 2·5 γ copper in 40 ml. of nutrient solution

the colours are, respectively, yellow, yellowish-brown, grey-brown, grey-black, and black.

For the estimation of molybdenum increasing amounts of the element increase the weight of mycelium produced up to 0·02 γ molybdenum per 40 ml. nutrient solution, which must contain nitrate nitrogen. It is possible to estimate one hundred thousandth mg. molybdenum by this method.

R. E. Buchanan, R. St. John-Brooks, and R. S. Breed (p. 587) set out an edited version of the bacteriological code of nomenclature which was developed by the Judicial Commission, approved and recommended by the Nomenclature Committee, and adopted unanimously at the fourth International Congress. It contains the following chapters: I, General considerations; II, general principles; III, rules of nomenclature with recommendations (comprising seven sub-sections: naming of groups of various ranks, designation of nomenclatural types, publication of names, citation of authors and names, changes in names as a result of segregation or union of groups or change in rank of groups, rejection and replacement of names, and orthography and gender of names); and IV, provisions for exceptions to the rules and for the interpretation and modification of rules.

Harris (R. V.). **Plant pathology.**—*Rep. E. Malling Res. Sta., 1947*, pp. 37–39, 1948.

In this report [cf. *R.A.M.*, 26, p. 159; 27, p. 246] it is stated that trials have shown that no commercial strawberry variety possesses appreciable resistance to *Verticillium albo-atrum* [ibid., 27, p. 373] when grown in severely infected soil.

A study of the fungi associated with raspberry cane blight showed that *Leptosphaeria coniothyrium* [ibid., 26, p. 159; 27, p. 512] was absent from local plantations in 1947, though much in evidence on the Newburgh variety in Surrey. A species of *Phoma* associated with cane blight lesions was not found locally, but was prevalent near Canterbury. Two species of *Fusarium* were common in most plantations, one doing considerable damage, particularly to Newburgh, though neither this fungus nor the *Phoma* produced lesions as severe as those due to *L. coniothyrium*. The *Phoma* appears to be a state of *Didymella applanata* [ibid., 25, p. 125; 27, p. 274]. The surface flora of the cane contained pathogenic fungi before attack by the midge *Thomasiniana theobaldi* [ibid., 26, p. 159]; the adult midge was found to carry fungi, though it is improbable that the larva does. Slugs and snails do so internally.

Work on the separation of strawberry virus complexes [ibid., 27, pp. 140, 571] showed that at least five, probably six, viruses are involved. The fourth, common in commercial stocks, differs from the others in that *Fragaria vesca* appears to be tolerant of it and does not show clear symptoms. The fifth has been isolated only from an American variety.

The relationship between apple brown rot (*Monilia* [*Sclerotinia*] *fructigena*) and insect, fungus, and mechanical wounds was confirmed in the field and the relative importance of each wound agent determined by comparing spray programmes from each of which a different specific was omitted. Insecticidal treatments against the nut weevil (*Balaninus nucum*) gave promising control of brown rot *S. fructigena* [ibid., 27, p. 266].

Stations fédérales d'essais viticoles, arboricoles et de chimie agricole, à Lausanne et à Pully. Rapport d'activité 1947. [Report for 1947 on the work of the Federal Viticultural, Arboricultural, and Agricultural Chemistry Stations at Lausanne and Pully.]—*Annu. agric. Suisse*, 49, 6–7, pp. 555–660, 3 graphs, 1948.

The following items are contributed by M. Staehelin and W. Wurgler in the section of physiology and plant protection [cf. *R.A.M.*, 27, p. 272]. The hot, dry summer of 1947 was not specially propitious for the development of vine downy mildew (*Plasmopara viticola*), and under the prevailing conditions 0·4 per cent.

copper oxide (Sandoz) gave reasonably good control in four vineyards, reducing the incidence of infection on the berries from 80·5 to 1·08 and 1·91, 27·3 to 1·65 and 0·73, 63·5 to 1·6 and 0, and 100 to 1 and 2 per cent. In all the tests, however, Bordeaux mixture proved slightly superior, with a maximum of 0·4 per cent. mildewed grapes.

In comparative tests in two orchards on the efficiency of lime-sulphur and two organic sulphurs for the control of apple scab (*Venturia inaequalis*) [ibid., 27, p. 428], five post-floral treatments at normal dosages being given in each case, the percentage of scabbed leaves at the end of the season was 8·5 and 4·7 per cent. in the lime-sulphur-treated plots, 25·4 and 5·9 in those sprayed with one organic sulphur, 44·7 and 17 with the other, and 77·5 and 42·3 in the controls. The lime-sulphur, however, caused severe leaf scorch. In another trial the level of control obtained with 1 per cent. wettable sulphur was comparable to that resulting from the lime-sulphur schedule (98 and 90 per cent. reduction of scabbed fruits in the former case and 96 and 92 in the latter).

In experiments to determine the relative efficiency of lime-sulphur plus iron sulphate and wettable sulphur in the control of apple mildew (*Podosphaera leucotricha*) [ibid., 27, p. 369], the pre-floral applications (16th and 23rd April) consisted of lime-sulphur 2 per cent., iron sulphate 0·8 per cent., and a wetter 0·1 per cent., and 2 per cent. wettable sulphur; the first post-floral (13th May) of lime-sulphur 1 per cent., iron sulphate 0·6 per cent., and wetter 0·1 per cent., and 1 per cent. wettable sulphur; the second post-floral (3rd June) of lime-sulphur 0·8 per cent., iron sulphate 0·4 per cent., and wetter 0·1 per cent., and 1 per cent. wettable sulphur; and the third post-floral (17th June) of lime-sulphur 0·5 per cent., iron sulphate 0·1 per cent. plus lead arsenate, and 1 per cent. wettable sulphur plus lead arsenate. The percentages of mildew reduction obtained on the Virginia, Melba, and Chevroux varieties with the lime-sulphur-iron sulphate mixture were 82, 86, and 76, respectively, compared with 51, 51, and 59, respectively, for the wettable sulphur programme. A further advantage of the lime-sulphur–iron sulphate mixture is its freedom from injurious effects on the foliage.

Comparative experiments were carried out in the control of peach mildew (*Sphaerotheca pannosa* [var. *persicae*]) in an orchard which had already received a dormant application of 2 per cent. lime-sulphur and 2 per cent. copper oxychloride. The seven post-floral treatments (beginning of April to early August) comprised the organic sulphurs (pomarsol and organol at 1 per cent.), wettable sulphur (1 per cent.), and lime-sulphur (0·5 per cent. plus wetter 0·2 per cent.). Pomarsol and organol gave the best results, reducing the incidence of infection on the fruits from 30·1 to 9·3 and 7·1 per cent., respectively, followed by the wettable sulphur (10·5).

Endives forced in cellars sustain heavy damage from *Marssonina panattoniana* [ibid., 13, p. 493], which can be substantially reduced by a preliminary cleaning of the plants (removing the outer leaves covering the terminal bud) and immersion of the bud and root-collar in a 0·5 per cent. solution of oxyquinoline. In a test in which one lot of plants was left untreated, one cleaned, and one cleaned and disinfected before transference to a mixture of moist sand and peat in a warm dark cellar, the percentages of disease at the end of 45 days' forcing were 95 (unsaleable), 49, and 5, respectively [cf. ibid., 28, p. 109].

The elimination before planting of all *Gladiolus* bulbs attacked by *Sclerotinia gladioli* and the immersion of the remainder for four hours in an organo-mercuric solution at 15° to 20° C. gave satisfactory results [ibid., 26, p. 58], 95 per cent. of the plants producing normal blooms as against 30 per cent. of the untreated.

A number of virus diseases have been observed on kitchen-garden and ornamental plants, including one on lettuce transmissible through the seed, and for which dandelion acts as an intermediate host [cf. ibid., 26, p. 407].

The following conclusions have been reached on the basis of studies from 1945 to 1947 on the dying-off of apricots in Valais. Gum formation, invariably originating in a wound, and the resultant occlusion of the vessels is the determining factor in the etiology of the disease. In the apricot, as in other fruit trees, a necrosis develops immediately below the injury, with infiltration of the gum into the vessels and woody parenchyma. Peculiar to the apricot, however, is the production by the necroses of toxins disorganizing the functions of the cambium and inciting the formation of a spongy tissue, composed of rounded cells devoid of vessels, which in its turn soon undergoes gummosis. The temporary or permanent duration of the disorganization depends on whether the shock due to contact with the necrotic tissues is violent or slight and occurs only once or repeatedly. The risk of gummosis developing through pruning injuries applies chiefly to the thick leading branches. Partial control was effected by the application of resin or of lanoline paste containing 0·5 to 1 per cent. α-naphthylacetamide. Gum formation in the cambium is further induced by the incisions made in the cortex and xylem by the females of *Ceresa bubalus* in the course of oviposition. The exudation of the gum prevents the healing of the wounds, which may be so numerous as to kill the young branches and twigs, besides serving as channels for the ingress of the highly pathogenic Valsaceae. The control of these fungi necessitates copper treatments before the onset of winter. They should not, however, be applied until the wounds are dry and cicatrized after pruning in August and the application of putty.

Monilia cinerea [*S. laxa*] may be responsible for peach gummosis through the invasion of the buds, while the fruits mummified by *M.* [*S.*] *fructigena* can also initiate rotting of the branches followed by an infiltration of gum. The latter organism proceeds downwards into the peduncle and then for a distance of 12 cm. into the subtending branch, causing necrosis of the tissues and vascular gummosis until it is isolated and its progress impeded by a protective cork layer.

Orian (G.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1947*, pp. 37–43, 1948.

In this report [cf. *R.A.M.*, 26, p. 234] it is stated that sugar-cane red rot (*Physalospora tucumanensis*) [ibid., 27, pp. 157, 386] was found occasionally in Mauritius in 1947 in fields of M. 134/32, but on the whole the crop was remarkably free from the disease, climatic conditions having been very favourable to cane growth.

A few chlorotic leaflets presenting a peculiar dappled appearance were found on the oldest leaf of the crown of an otherwise apparently healthy areca palm (*Areca catechu*) growing near the spot where royal palms [*Roystonea regia*] had been affected by bud rot (*Xanthomonas vasculorum*) [ibid., 27, p. 234] in 1944. When examined by transmitted light the affected leaflets showed long, faint, yellowish-brown veins extending from the dead areas, and gum exuded from whole-leaf sections under the microscope. *X. vasculorum* was isolated from the leaflets, and its identity confirmed by inoculations of sugar-cane leaves and maize.

A severe wilt of 'gingeli' or 'lady's fingers' (*Musa* sp.) and 'carrée' (*Musa paradisiaca*) bananas occurred at Moka. In the underground parts were plates of white mycelium between the leaf sheaths and within the tissues of the corm. The condition appears to resemble *Marasmius* root disease of bananas described from the West Indies [*M. stenophyllus*: ibid., 18, p. 328]. The fungus grows very slowly on ordinary media. Dwarf bananas (*Musa cavendishii*) were affected by an undetermined disease, apparently of long standing, characterized by reduced petiole length (the leaves remaining crowded together), failure of the fruit bunches to develop normally, and pseudo-stem rot.

In a study of cassava bacterial blight inoculations were made into cassava leaves with the organism isolated from affected material and with *Xanthomonas solanacearum* from diseased potato and *Solanum auriculatum*. All inoculations of cassava

leaves with the cassava isolate gave positive results, whereas those with *X. solanacearum* proved negative. The cassava organism was identified by Dr. M. P. Starr as *X. manihotis* [ibid., 17, p. 650].

A study was made of a blight of *Paspalum dilatatum*, which began at the leaf tip and ran down one edge, the tissues yellowing before dying out. A narrow, yellow stripe of constant width, with diffuse borders ran the length of some leaves, while a white line was occasionally present, as in sugar-cane leaf scald. A bacterium isolated from affected material was proved by inoculation to be pathogenic. Its characters closely resembled those of *X. albilineans* isolated from sugar-cane leaves with leaf scald, and both organisms induced similar symptoms in maize and *Thysanoloena maxima*. While, however, the *P. dilatatum* isolate also produced white lines when inoculated into spindles of sugar-cane, Job's tears [*Coix lacryma-jobi*], and elephant grass [*Pennisetum purpureum*], as does *X. albilineans*, the two organisms showed more important differences on these plants than on maize and *T. maxima*. Also, infection of sugar-cane by the *P. dilatatum* organism does not become systemic, while certain constant differences in inoculated plants show definitely that the two organisms are not identical.

On p. 18 H. Evans states that aretan has given outstanding protection against sugar-cane pineapple disease [*Ceratostomella paradoxa*: ibid., 27, p. 542], with yield increases of three to four tons per acre. It is already widely used for the pre-planting treatment of sugar-cane cuttings and should be universally adopted in Mauritius.

In the section on tobacco research (pp. 56–67) L. Suzor states that in preliminary experiments folosan [ibid., 20, p. 146] was as effective as Cheshunt compound in controlling damping-off. In a black shank [*Phytophthora parasitica* var. *nicotianae*: ibid., 27, pp. 48, 390] resistance trial begun in 1946 in which F_1 hybrids between the highly resistant cigar-wrapper variety Rg and eight established flue-cured varieties were grown with the nine parent varieties, the results showed that the hybrids were much more resistant than the parents, except Rg. Root infection of the hybrids was greater than that of Rg, but much less than that of the other parent varieties.

In a further trial a greater number of plants was harvested from hybrids than from the parent varieties except Rg. Florida 301 appeared to be the most resistant of three new varieties tested.

Annual Report of the Agricultural Experiment Station, Florida, for the year ending June 30, 1947.—260 pp., 16 figs., 7 graphs, [? 1948].

In the plant pathology section (pp. 92–96) of this report [cf. *R.A.M.*, 27, p. 125] W. B. Tisdale states that in the greenhouse and in outdoor plots the addition of green vegetation to soil infected with *Rhizoctonia* sp. two weeks before cabbage and lettuce seed was sown again significantly reduced emergence and (indoors) the size attained by the plants in 28 days. There was some indication of antagonism by *Trichoderma* towards *Rhizoctonia*. Addition of green organic matter to the soil 14 days before sowing seed of Fordhook Lima beans [*Phaseolus lunatus*] made no significant difference to emergence, but the seedlings emerged with seed coats attached to the cotyledons with *Rhizoctonia* mycelium. The fungus had killed or caused a ragged condition of many plants, which grew slowly, and developed deeper stem lesions at soil level than plants without additional organic matter.

In a seed-treatment test with machine-shelled Florida Runner groundnuts arasan (0·125 per cent.), spergon (0·2 per cent.), and dow 9 B (0·125 and 0·25 per cent.) increased germination by 28, 24, 18, and 15 per cent., respectively.

In further breeding work with eggplants for resistance to blight (*Phomopsis*) [*vexans*] P. Decker found that 20 hybrid lines produced four to six times more marketable fruits than any standard varieties. Selection of foundation seed for a new variety is being undertaken.

Further isolations by E. West from 285 specimens of die-back of *Camellia japonica*, *C. sasanqua*, and *C. saluenensis* yielded *Gloeosporium* sp., *Diplodia* sp., and *Phomopsis* sp., *Gloeosporium* sp. being most common and *Phomopsis* sp. rather rare. Inoculations without wounding gave negative results. Leaf gall (*Exobasidium camelliae*) [ibid., 27, p. 126] was found several times on *C. sasanqua* and once on *C. japonica*. Other *Camellia* diseases included crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*).

P. Decker and R. C. Bond found that *Sclerotium rolfsii* caused 70 per cent. loss of lupin seedlings in fields in the Gainseville area, and was more abundant in the Quincy area than in earlier years, while *Rhizoctonia* sp. was present in all fields, but was not serious [loc. cit.]. The apothecia of a *Sclerotinia* [loc. cit.] were found in November and December, 1946, in fields affected by the disease in 1945–6, proving that the fungus can oversummer in the soil.

Powdery mildew (*Erysiphe* sp.) [? *E. polygoni*] developed on all blue lupins in the Gainseville area that were not killed by cold. Infection appeared just before blooming, causing leaf shedding and again seriously affected seed development.

Sixtieth Annual Report of the Kentucky Agricultural Experiment Station for the year 1947.—76 pp., 1948.

In this report [cf. *R.A.M.*, 27, p. 64] it is stated that 13 new Burley tobacco varieties resistant to mosaic [ibid., 28, p. 250] proved highly resistant to black root rot [*Thielaviopsis basicola*] in 1947 under conditions extremely favourable for its development. Attempts made during the past 13 years to develop mosaic-resistant Burley varieties carrying the resistance factors from Ambalema have yielded a stand-up variety which is highly resistant to *T. basicola* and mosaic and has shown no signs of wilting or scalding for the past three years. Several typical Burley selections appear to be as highly resistant to wildfire [*Pseudomonas tabacum*] as *Nicotiana longiflora*, the male parent.

The Burley variety F 17A, 46, resistant to black root rot, mosaic, and *Fusarium* wilt [*F. oxysporum* var. *nicotianae*], was the only one which stood up well and produced an excellent yield of good quality tobacco. Such a variety should rapidly replace Ky 33, which is being dropped from the list of certified varieties since it proved too susceptible to black root rot during the exceptionally cool summer of 1947.

Three-year average yields (1945 to 1947) of the mosaic-resistant hybrid strains and certain standard varieties of dark tobacco from which these resistant strains have been developed were as follows: Brown Leaf 1,278 lb. per acre; mosaic-resistant strains of Brown Leaf, Ky 150 1,330 lb., Ky 151 1,483 lb., Ky 153 1,520 lb., R27–44 1,454 lb.; the varieties Little Crittenden 1,486 lb., Mosaic Resistant Little Crittenden 1,501 lb., Little Orinoco 1,532 lb., Mosaic Resistant Little Orinoco 1,591 lb., and Mosaic Resistant One Sucker 1,767 lb.

None of the 460 tobacco varieties tested proved sufficiently resistant to streak [ibid., 28, p. 85] to offer promise as breeding stock, indicating that it will be necessary to look to other *Nicotiana* species for resistance to this virus.

Vigo wheat showed somewhat more resistance during a severe leaf [brown] rust [*Puccinia triticina*] epiphytotic than any of the eleven accompanying varieties.

Helminthosporium victoriae [ibid., 28, p. 11] caused the yield of susceptible oat varieties to be as much as 50 to 75 per cent. lower than that of resistant strains. Seed treatment reduced the seedling infection to some extent but did not prevent infection in the mature plant stage and cannot be regarded as an effective method of control.

In tests for control of apple scab [*Venturia inaequalis*: ibid., 28, p. 68], puratized agricultural spray was completely satisfactory in the plots at Princeton and Owensboro, but at Mayfield liquid lime-sulphur gave better control. Cedar apple rust

[*Gymnosporangium juniperi-virginianae*: ibid., 27, p. 573] and quince rust [? *G. clavipes*: ibid., 27, p. 96] were somewhat serious on the trees at Princeton treated with puratized agricultural spray. In a comparative test in which cuprocide (1½ lb. per 100 gals. water), alternating fermate and zerlate (2 lb. per 100 gals.), and syndeet (1 lb. per 100 gals.) were each applied four times for the control of blight [*Phytophthora infestans*: ibid., 27, p. 437] on the main-season tomato crop at the Experiment Station, cuprocide proved most effective in reducing the number of blighted tomatoes, increasing the average size of the fruit and yield over that of the unsprayed plots. When cuprocide, parzate, and copper A were compared on the late crop, cuprocide was again effective, but copper A gave 1·26 more tons per acre of fruits that were larger in average size. Parzate gave good blight control but the yield was low.

Landerkin (G. B.) & Lochhead (A. G.). **A comparative study of the activity of fifty antibiotic Actinomycetes against a variety of soil bacteria.**—*Canad. J. Res.*, Sect. C, 26, 6, pp. 501–506, 2 graphs, 1948.

Fifty Actinomycete strains selected from isolates from various soils on the basis of their antibiotic activity against *Escherichia coli* were tested against twelve soil organisms at the Division of Bacteriology and Dairy Research, Ottawa. Of the plant pathogens, grown on agar media, *Corynebacterium sepedonicum* [*R.A.M.*, 27, p. 293] was the most readily inhibited species, followed (in decreasing order) by *Actinomyces scabies*, *Erwinia carotovora*, *Xanthomonas phaseoli*, and *X. campestris*, which was inhibited by 66 per cent. of the Actinomycetes.

Limón (B.). **Algunas enfermedades fungosas del Cacaotero en Tabasco.** [Some fungal diseases of Cacao in Tabasco.]—*Fitofilo*, 4, 4, pp. 193–239; 5, pp. 288–318, 33 figs., 1 diag., 5 graphs, 1945. [Mimeographed.]

This is a valuable summary of the available information on the following diseases of cacao in Tabasco, Mexico, and their control: root rots caused by *Armillaria mellea*, *Rosellinia pepo*, *R. bunodes*, and *R. paraguayensis*; trunk and branch canker and black rot of the pods (*Phytophthora faberi* [*P. palmivora*]); and brown rot of the pods (*Botryodiplodia theobromae*).

Miller (W. B.). **Recommended cereal varieties.**—*J. Dep. Agric. Vict.*, 47, 2, pp. 62–66, 2 figs., 1949.

Notes are given on the qualities and disease resistance of the main wheat varieties recommended for 1949 sowing in the various districts of Victoria [cf. *R.A.M.*, 28, p. 280]. The new varieties Pinnacle and Insignia [ibid., 27, p. 358], highly resistant and resistant to flag smut [*Urocystis tritici*], are recommended for the Wimmera and Mallee, respectively.

Johnson (T.). **Field infection experiments with races 15A and 15B of Puccinia graminis tritici.**—*Phytopathology*, 39, 1, pp. 41–46, 1949.

Four wheat stem [black] rust (*Puccinia graminis tritici*) cultures identified by means of seedling inoculation tests as race 15A and two of 15B [*R.A.M.*, 26, p. 385] were compared for pathogenicity towards a group of varieties in small field plots in 1945, 1946, and 1947, using Cherewick's method for the establishment of rust epidemics [ibid., 26, p. 193]. Race 15B proved to be decidedly more virulent than 15A on the black rust-resistant common wheats now grown in Canada and certain others usually regarded as possessing a high degree of resistance, e.g., the Kenya selections, Red Egyptian, and McMurachy, used as breeding material. Even the highly resistant *Triticum timopheevi* contracted 4, 5, and 4 per cent. infection with race 15B [cf. ibid., 28, p. 166] in the 1945, 1946, and 1947 experiments, respectively.

Stakman (E. C.), Harrar (J. G.), Loegering (W. Q.), & Borlaug (N. E.). **Recent changes in prevalence of physiologic races of Puccinia graminis tritici in south-central Mexico.**—Abs. in *Phytopathology*, 39, 1, p. 23, 1949.

Races 17 and 56 of *Puccinia graminis tritici*, among the most prevalent in the United States and northern Mexico since 1939 and 1934, respectively [*R.A.M.*, 24, p. 222; 25, p. 72], now appear to have also become firmly and widely established in south-central Mexico, where they comprised 5, 13, 15, 28, and 34 per cent. of the total number of isolates obtained annually in south-central Mexico from 1944 to 1948, inclusive. Prior to 1945 other races, predominantly 19, 38, and 59, constituted 93 per cent. or more of the total number of isolates each year, but from 1945 to 1948 the percentages of these races were 87, 85, 72, and 66, respectively. In 1948 races 17 and 56 comprised 25 and 10 per cent., respectively, of all isolates, both being widely distributed though apparently most prevalent in and near the State of Guanajuato, where stem [black] rust was destructively epidemic. This new development carries important implications for the black rust resistance programme, since certain varieties hitherto resistant in south-central Mexico will henceforth be susceptible if races 17 and 56 persist.

Sprague (R.). **Selenophoma spot, a new Wheat disease for North America.**—Abs. in *Phytopathology*, 39, 1, p. 23, 1949.

In March, 1948, *Selenophoma donacis* var. *stomaticola* [*R.A.M.*, 27, p. 324] appeared suddenly in a fairly severe form on wheat, a hitherto unreported host, over wide areas in the Palouse district of Washington and Idaho. The initial symptoms, consisting of pinkish-buff, irregularly elliptical spots on the foliage, were followed in June by the development of ashy, circular foliar lesions, with a darker, narrow margin. Inoculation tests on several Gramineae resulted in a few sterile spots on Federation wheat and Kentucky bluegrass [*Poa pratensis*] only. The fungus is tentatively designated race 12 of *S. donacis* var. *stomaticola*. Varietal reactions in wheat to the pathogen ranged from high susceptibility in Rex and Orfed to strong resistance in Kharkof, Comanche, and Hymar × Elgin 3 (F_4 composite).

Sempio (C.) & Shkjezi (A.). **Metabolismo nelle piante carenti. I. Fotosintesi e respirazione in piantine di Frumento Kcarenti.** [Metabolism in nutrient-deficient plants. I. Photosynthesis and respiration in Wheat seedlings deficient in potassium.]—Reprinted from *Ann. Fac. agr. Perugia*, 4, 10 pp., 1946. [Received March, 1949.]

When Mentana and S. Georgio wheat seedlings were grown in Pfeffer's nutrient solution and the same without potassium salts, after the development of the third leaf the potassium-deficient seedlings were mostly shorter and paler than the others and marked apical burning frequently affected the first, and sometimes the second, leaf. The respiration rate was about the same in both series, but photosynthesis in the potassium-deficient series was two to three times as high as in the controls. Such a considerable increase can itself be regarded as the primary cause of potassium deficiency symptoms in seedlings of this age. It is considered that it is the marked change in the relationship between the functions of photosynthesis and respiration which is the main feature of the condition and the real cause of the pathological state presented by the plants.

Chemical analyses showed that the plants in the complete nutrient solution contained only a trace of starch and 0·43 per cent. reducing sugars (as glucose in fresh material) while the corresponding figures for the potassium-deficient series were 5·7 and 0·35 per cent. The high starch content confirms the prevalence of the processes of synthesis over those of katabolism in the potassium-deficient plants and also shows the marked accumulation of insoluble products not utilizable in the metabolic exchange.

Sempio (C.). **Influenza della luce continua sulla resistenza del Frumento all' Erysiphe graminis e meccanismo di tale resistenza.** [Influence of continuous light on the resistance of Wheat to *Erysiphe graminis* and the mechanism of such resistance.] -Reprinted from *Riv. Biol.*, 35, 11 pp., 1 graph, 1943. [Received March, 1949.]

Wheat seedlings of seven different varieties, inoculated with a conidial suspension of *Erysiphe graminis*, were exposed (as the third leaf developed) for 11½ days to continuous illumination by electric lamps with a total power of about 1,500 kw. [*R.A.M.*, 19, p. 108; 26, p. 538; and below, p. 350], similarly inoculated plants being similarly exposed for four consecutive days and subsequently exposed to alternating 12-hour periods of light and dark, while the controls were exposed to alternating 12-hour periods of light and dark from the beginning of the experiment. After 11½ days, all were then exposed to ordinary daylight, and the progress of infection was observed every three or four days.

The results obtained showed clearly that continuous exposure to the light for ten or eleven days reduced and almost inhibited infection permanently. In the plants exposed continuously to the light for the first four days of the disease, infection was marked but was appreciably less severe than that in the controls. This shows that continuous exposure to light during the first period of infection [ibid., 18, p. 471] exercises a depressing effect on the disease which has a certain influence on its subsequent development. Other experiments demonstrated that exposure to darkness during this first period of infection stimulated the development of the disease. Further work, not described in the present paper, showed that when the inoculated plants were exposed to the light continuously in the third phase of infection, the disease was stimulated as compared with the controls, particularly in precocious varieties, such as Mentana and Littorio, while exposure to darkness had the opposite effect.

The data obtained on the respiratory and glycolytic activity of the plants clearly demonstrated that exposure to continuous light stimulated the metabolic energy of the treated plants, in which the respiratory and, particularly, the glycolytic activity were constantly higher than in the controls.

It is concluded that the increased resistance to *E. graminis* brought about in the wheat seedlings by continuous exposure to light appears to be strictly correlated with marked increase in the metabolic energy of the tissues, particularly as regards their glycolytic ability.

Favret (E. A.). **On the genetics of resistance to mildew in Barley.** —Abs. in *Phytopathology*, 39, 1, p. 6, 1949.

In studies at the University of California on the inheritance of resistance to physiologic race 3 of *Erysiphe graminis hordei* [*R.A.M.*, 28, p. 169], the Monte Cristo and Engledow India varieties were found to carry a dominant gene for immunity, which has been designated Ml^m and is linked with one of the Nigrate factors determined by Briggs [cf. ibid., 22, p. 224]. The resistance of West China barley is conferred by a single recessive factor termed ml^w. Probably the resistance of Gopal was controlled by two linked major genes, with a cross-over value of about 15 to 20 per cent. With the two above-mentioned factors, nine genes are already known to be involved in the resistance to race 3 of barley mildew, the maximum number of loci correlated with resistance to a plant disease.

Leukel (R. W.)& Johnson (A. G.). **Periconia circinata, the cause of Milo disease.** —*Science*, 107, 2769, pp. 93–94, 1948.

This information has been noticed from another source [*R.A.M.*, 28, p. 170].

Quinby (J. R.) & Karper (R. E.). **The effect of Milo disease on grain and forage yields of Sorghum.**—*Agron. J.*, 41, 3, pp. 118–122, 1 fig., 1949.

Yield trials which have been in progress for ten years at one Texas experiment station (Chillicothe) and for nine at another (Lubbock) indicate that losses of 50 to 60 per cent. from milo disease (*Periconia circinata*) [see preceding abstract] are to be expected whenever a susceptible variety is grown on infested soil. However, resistant strains of susceptible varieties, e.g., Dwarf Yellow, Sooner, Darso, Beaver, and Sumac, have been developed, and such heavy reductions may be avoided by their use.

Haas (A. R. C.). **Effect of potassium on Citrus trees.**—*Calif. Citrogr.*, 33, 11, pp. 468, 486–488, 490, 4 figs., 1948.

Solution, sand, and soil cultures, representing a range of maintained potassium concentrations, have been in progress at the California Citrus Experiment Station since 1920 for the purpose of determining the symptoms of potassium deficiency [*R.A.M.*, 23, p. 386 and next abstracts] or excess in orange and lemon trees. It remains to be determined whether the various symptoms found are also present in commercial orchards, whether potassium is involved, and the condition can be alleviated by increasing the available potassium.

The severe leaf fall which occurred especially near the flowering period in potassium deficient cultures, and its effect on the organic and mineral reserves in the tree, may be responsible for the reduction in fruit set and size. As the potassium level in orange trees was greatly reduced, the number of flowers produced and the percentage of potassium in the dry matter of the flowers decreased and the total phosphorus content in the leaves, peel, and pulp greatly increased. At constant nitrogen levels there was a tendency for the magnesium percentage to be lower in orange and lemon leaves as the potassium level was greatly reduced. The potassium content of lemon peel and pulp markedly increased when the potassium level was increased from 15 to 50 p.p.m.

Haas (A. R. C.). **Symptoms of low potassium in leaves of Citrus orchards.**—*Calif. Citrogr.*, 33, 12, pp. 520, 530, 532, 534–535, 3 figs., 1948.

Leaf analyses and soil surveys have so far given no evidence of potassium deficiency [*R.A.M.*, 23, p. 386 and preceding and next abstracts] in citrus orchards in California and it is concluded that these soils are sufficiently, if not excessively supplied with potassium. Lemon leaves, collected in 1947 and 1948 in various orchards, showed distinct symptoms of interveinal yellowing, infiltrated or encircled by a resinous material, the yellow centres often dropping out. Grapefruit and orange leaves had similar yellowing and resinous spotting. All affected leaves were found to have a low potassium content, often accompanied by high calcium and magnesium values. Since the potassium content of citrus leaves decreases as they mature, it is suggested that an ample supply of potassium in the leaves may delay approaching senility.

Chapman (H. D.), Brown (S. M.), & Rayner (D. S.). **Effects of potash deficiency and excess on Orange trees.**—*Hilgardia*, 17, 19, pp. 619–650, 6 pl. (5 col.), 1947. [Received February, 1949.]

At the Citrus Experiment Station, California, an experiment, in which 20 budded four-year-old Washington Navel and Valencia orange trees were grown out-of-doors for six years in nutrient solutions of varying potassium content [see preceding abstracts], was carried out to supplement preliminary greenhouse experiments on the effects of potassium deficiency [*R.A.M.*, 22, p. 63; 26, p. 337].

Trees suffering from acute potassium deficiency showed pronounced leaf distortion and fading of chlorophyll. Branch and shoot die-back occurred, new growth was weak, and leaves were undersized. Blossoms were sparse but a few fruits were produced which, although small, were firm and of good quality. Where potash was only slightly deficient the chief effect on fruit was a reduction in size.

Trees receiving excess potassium became defoliated and dwarfed and produced large, coarse fruits with thick skins, coarse flesh, and poor eating quality. It appears that the potassium level in the tree may vary through a fairly wide range without materially affecting growth and appearance. No signs of deficiency developed under the conditions of the experiment at potassium concentrations ranging from 2 to 3 p.p.m. At concentrations of 390 p.p.m. (ranging from 350 to 400 p.p.m.) the trees were injured; at 117 p.p.m. no ill effects were seen.

[A shorter version of this work appears in *Calif. Citrogr.*, 33, 7, pp. 278–279, 290, 6 figs., 1948.]

Castanie (H.). **Le baïoudh, maladie du Dattier, danger des palmeraies.** [Baïoudh, a disease of the Date Palm, a threat to Palm plantations.]—*Fruits & Primeurs*, 18, 196, p. 344, 1948.

The 'baïoudh' disease of date palms sometimes attributed to *Fusarium* or to *Cylindrophora albedinis* [*R.A.M.*, 27, p. 419] now occurs mainly at Figuig [Morocco]. The leaves become quite white, then a general collapse occurs and the trees die one or two years later. Both old and young trees are equally subject to attack. The disease first appeared at Fatis and Ajdir in 1912; no trace of it has been found around Colomb-Béchar and Beni-Abbès. The knowledge of the disease is still insufficient for any efficient, rigorous control measures to be devised, although some amelioration has been achieved by the use of disinfectants and by burning condemned trees.

King (C. J.) & Brinkerhoff (L. A.). **The dissemination of Xanthomonas malvacearum by irrigation water.**—*Phytopathology*, 39, 1, pp. 88–90, 1 diag., 1949.

Further evidence is presented to show that surface irrigation water may serve as an agent in the dissemination of *Xanthomonas malvacearum* in Arizona cotton fields [*R.A.M.*, 18, p. 520]. In a test carried out in 1943, both surface irrigation and sprinkling were effective in the diffusion of the pathogen. Acala bolls were collected in February from a field where angular leaf spot [blackarm] had occurred in the previous season, and in March they were spread across the upper end of a plot on which no cotton had been grown for several years. The soil was ploughed, irrigated, and disked, and on 23rd March, disease-free S × P seed was planted. A good stand developed and a small percentage of the Acala bolls produced seedlings. On 27th April about half the latter showed blackarm symptoms, but the S × P seedlings were healthy. On 11th May, all the Acala seedling clumps were removed except five in line with the seed rows, and the next day a rotating lawn sprinkler was placed in the plot near the diseased seedlings. Within ten days, most of S × P seedlings within the sprinkled area had also contracted blackarm, whereas all those outside it remained healthy. On the 22nd, flood irrigation was applied to the entire plot, the seedlings being partially immersed for about one hour. On 2nd June the stand was thinned to approximately 15 in. spacings and mapped for diseased seedlings. Blackarm was present below and immediately to the sides of the sprinkled area, involving about half the thinned stand, while the upper portion of the plot and the outside rows remained free from infection. Thus, the disease has spread in the same general direction as the flow of the irrigation water. In two instances the pathogen had been carried to seedlings at the end of the plot, a dis-

tance of 25 ft. No rain fell between the time of planting and the final inspection of the plot.

Dresner (E.). **Culture and use of entomogenous fungi for the control of insect pests.** —*Contr. Boyce Thompson Inst.*, 15, 6, pp. 319–335, 2 pl., 1949.

In testing the properties of three entomogenous fungi for insect control, *Beauveria bassiana* [*R.A.M.*, 21, p. 253; 27, p. 100 *et passim*] was found to be the most effective in control and productive of spores in artificial culture. Bulk medium of tender green bush beans (*Phaseolus vulgaris*) either whole and water saturated, or water-saturated and ground to a paste, sprayed with a spore suspension of the fungus yielded 60 gm. spores per lb. of beans, sufficient for dusting about 3 acres. The spores were used in a wheat flour carrier. Although liquid sprays were more effective, dusts were preferred as being more practicable and economical in spores.

The susceptible species include American cockroach nymphs (*Periplaneta americana*), first and second nymphs of locusts and grasshoppers, three lepidopterous larvae, all stages of Mexican bean beetle (*Epilachna varivestis*), adult rice weevils (*Sitophilus oryza*), nymphs and adults of black bean aphid (*Aphis rumicis*), rose aphid (*Macrosiphum rosae*), two-spotted spider mite (*Tetranychus bimaculatus*), and housefly eggs, larvae, and adults. Slugs (*Limax* sp.) were also killed.

Ten adult rice weevils placed with rice grains dusted with 0·3 per cent. *B. bassiana* spores at temperatures of 65 to 85° F. and 35 to 85 per cent. relative humidity were killed within 15 days. In laboratory and field tests complete control was obtained of *P. americana*, *A. rumicis*, *M. rosae*, and larvae of the Southern house mosquito (*Culex quinquefasciatus*). Houseflies were all killed within three hours under humid conditions but not at 70 to 80 per cent. humidity. In field tests with *T. bimaculatus* on beans, an average of 71·1 per cent. was killed by dusting with 0·5 per cent. spores at 74° and 91·3 per cent. humidity, the same treatment resulting in some liquefaction of egg cluster cultures of *E. varivestis* within 18 hours, and 100 per cent. liquefaction within 72. Dusted larvae were all killed either as larvae or later as pupae. In a field test all 38 adult bean beetles placed on bean plants were attacked by the fungus when dusted with 0·5 per cent. *B. bassiana* spores. Large-scale dusting with 1 per cent. spores at 20 lb. per acre gave better control of the insects than 0·75 per cent. rotetone treatments under the frequent heavy rainfall occurring in New York during the test period.

Two natural outbreaks of *Empusa americana* which controlled an epidemic of blowflies (*Lucilia unicolor*) were correlated with periods of high humidity and frequent showers.

It is concluded that entomogenous fungi can play an important part in insect control in areas possessing optimum conditions for their development, such as the Atlantic Coast areas.

Houston (B. R.) & Knowles (P. F.). **Fifty-year survival of Flax Fusarium wilt in the absence of Flax culture.**—*Plant Dis. Reptr*, 33, 1, pp. 38–39, 1949. [Mimeographed.]

In July, 1948, two flax fields in San Mateo County, California, which had not been under cultivation for over 40 years and in which flax had not been grown since 1898, developed a severe outbreak of *Fusarium oxysporum* f. *lini* [*F. lini*: *R.A.M.*, 26, p. 545]. Introduction on the seed is considered unlikely because of the unequal distribution of the disease and the size of the infected areas. Plants were killed after about six inches' growth, in uniform areas of 10 to 100 sq. ft., which continued to enlarge throughout the growing period. 'Wild' flax (apparently either *Linum angustifolium* or an escape from the domestic flax planted in 1898), growing round the margins of the fields and in adjacent uncultivated areas, was found to be susceptible to the disease and was responsible for the outbreak.

Pasmo (*Sphaerella linicola*), browning (*Polyspora lini*), and anthracnose (*Colletotrichum lini*) [*C. linicola*] were also found occurring naturally on the uncultivated flax.

Thomas (W. D.). **The control of Fusarium root rot and bacterial wilt of Carnations by antibiotic fungi.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 3, 6, p. 39, 1948.

From numerous soil fungi tested in the laboratory for their antagonistic effects on the carnation pathogens, *Fusarium culmorum*, *F. dianthi* [*R.A.M.*, 25, p. 344], and *Phytomonas* [*Pseudomonas*] *caryophylli* [ibid., 22, pp. 240, 360], ten were selected and used in mass cultures for the inoculation of the soil in a bench of the Pink Fisher variety. A month later the pathogens were introduced into the soil. At the end of nine months two isolates of *Actinomyces scabies* were found to have significantly reduced the incidence of infection by *F. culmorum* and *P. caryophylli*, the last-named also being inhibited by *Aspergillus niger*. No control of *F. dianthi* was obtained. The antagonistic fungus was isolated from the soil in each case where control was apparent, suggesting the possibility of treating greenhouse bench soil with antibiotics to combat soil-borne diseases of carnations.

Marchionatto (J. B.). **El 'tizón' o 'podredumbre del tallo' del Conejito.** [The 'blight' or 'stem rot' of the Snapdragon.]—*Rev. Fac. Agron., B. Aires*, 12, 1, pp. 3–7, 1 col. pl., 2 figs., 1948. [English summary.]

The fungus responsible for a destructive stem blight and leaf spot of *Antirrhinum majus*, first observed in Buenos Aires in September, 1942, was identified as *Phyllosticta antirrhini* [*R.A.M.*, 21, p. 182]. It grew profusely on 1 per cent. potato dextrose agar, producing different types of colony, some of which were characterized by sparse mycelial and abundant pycnidial development, while in others the converse occurred. This behaviour is regarded as an illustration of the dual phenomenon in imperfect fungi described by Hansen [ibid., 22, p. 490]. The pathogenicity of the organism was established by inoculation experiments on *A. majus* seedlings under controlled conditions.

Runley (G. E.) & Thomas (W. D.). **Studies of the virus complex of Carnation.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 3, 6, pp. 40–41, 1948.

Attention is drawn to the increasing prevalence of carnation mosaic, streak, and yellows [viruses: *R.A.M.*, 24, p. 231] in Colorado. The losses due to the streak and yellows complex in 1947 amounted to more than 10 per cent. of the total production. Among the plants to which the carnation mosaic virus may pass are *Zinnia*, celery, sugar beet, *Calendula*, Pinto bean [*Phaseolus vulgaris*], hollyhock, white clover, sweet clover [*Melilotus*], and *Gladiolus*, while aster and *Nicotiana rustica* are liable to infection by streak. The former virus is readily disseminated by rubbing or with the cutting knife, while both mosaic and streak are transmissible by grafting. Cuttings should be treated with calcium chloride, zinc sulphate, or sulphathalidine.

Baker (K. F.), Clark (Lily H.), & Kimball (M. H.). **Association of Deuterophoma spp. with a Chrysanthemum stunt disease in California.**—*Plant Dis. Reptr*, 33, 1, pp. 2–8, 1949. [Mimeographed.]

During investigations of a hollow stem condition of chrysanthemum cuttings and plants in California two undescribed species of *Deuterophoma* were frequently isolated, type 1 occurring constantly and abundantly in plants with symptoms resembling stunt [*R.A.M.*, 27, p. 555]. Some infection was present in all commercial Californian lots examined. Certain private plantings, free from type 1, were also free from stunt. Type 1, or type 2, or both, also occurred occasionally on apparently healthy plants in varieties or fields in which stunt was present and both types may be associated with hollow stem. Isolations from stunted chrysanthemums obtained

from a greenhouse in Chicago yielded type 1 culture in one case and type 2 in another. Similar specimens from Barberton, Ohio, gave type 2.

Type 1 occurred in the vascular elements from the roots to the flower base, and is regarded at present as a probable pathogen. The colonies were grey to black with a yellowish-green surface growth prior to fructification; they sometimes produced a diffuse yellow pigment in the agar, had conspicuous, irregular, feathery, white margins, and were composed of a firm, compact mycelium which developed into a thick layer. Single-spore cultures developed mature pycnidia in 15 days, measuring 77 to 150 μ in diameter. They occurred singly or rarely fused in groups, were at first pale brown, later black, round, pyriform, or irregular and had definite ostioles, sometimes in necks up to 40 μ long. The pycnidial wall comprised thick-walled cells enclosing several layers of hyaline cells which gave rise to spores progressively from the centre, disintegrating as the spores formed. The one-celled, hyaline, oblong spores, measuring 2·5 to 4 by 1 to 1·5 μ, emerged in great numbers as milky droplets from the pycnidia. They were formed endogenously either directly through a pore from rounded pseudoparenchymatous cells or from flask-shaped phialides.

Type 2 appeared to occur chiefly in the cortical tissues and was confined to the roots and basal parts of the stems. It grew nearly twice as fast as type 1. The colonies were grey and fluffy. The pale brown, later almost black, round or hemispherical pycnidia which developed on tissues kept in a moist chamber and readily in culture measured 150 to 300 μ in diameter and were mostly formed partly embedded in tissue. The hyaline spores measured 3 to 6 by 2 to 3 μ.

Neither type of fungus was observed to sporulate under field conditions. As type 1 sporulates abundantly under water, pieces of infected tissue which are submerged in the hormone tank would provide a source of inoculum. Type 1 survived for at least two months in dried stems. Apparently, it might survive in compost piles, trash, and perhaps on equipment from one chrysanthemum crop to the next, and allow dissemination in material other than living plants. Experimental evidence indicated that heat therapy was ineffective.

Das (S. C.) & Motiramani (D. P.). **A preliminary note on diseases of Gram.**—*Curr. Sci.*, 18, 2, pp. 46–47, 1949.

In 1946–7, gram [*Cicer arietinum*] plants at the Indian Agricultural Research Institute Farm, New Delhi, showed top- and bottom-yellowing, yellowing and bronzing, and bronzing. Top-yellowing affected the growing tips which eventually became cream though the colour disappeared about flowering-time, growth and yield being reduced. In bottom-yellowing the lower leaves became yellowish and then the top ones were progressively affected; as the condition advanced, the plants displayed folded, drooping leaves and premature shedding set in. Yellowing and bronzing affected the bottom leaves first, the top leaves developing only bronzing. Bronzing spread from the lower leaves upwards, and was also marked by retarded growth, dwarfing, and reduced branching. Plants suffering from bottom-yellowing were the only ones in which a fungus [unspecified] was present.

Plants in these four categories and healthy plants contained, respectively, 28·6, 15·6, 25·3, 25·96, and 34·1 p.p.m. boron; 63·6, 130·1, 116·6, 94·8, and 126·2 p.p.m. manganese; 2,133, 4,104, 2,623, 1,673, and 1,600 p.p.m. iron; 5·3, 5·5, 2·5, 1·6, and 3·5 p.p.m. molybdenum; and 1·01, 0·7, 0·49, 0·35, and 0·61 per cent. phosphorus.

It appears that top-yellowing is associated with low manganese, bottom-yellowing with low boron and excess iron, yellowing and bronzing with low phosphate, and bronzing with low phosphate and molybdenum. The figures for 1948 again showed low phosphorus content for plants with bronzing and with yellowing and bronzing and low manganese for those with top-yellowing.

Sergeeva (Mme K. S.). О способах перезимовки ржавчины **Uromyces fallens.** [On the modes of overwintering of the rust *Uromyces fallens*.]—Природа [*Nature*], 4, p. 51, 1948.

The results of studies carried out at the Mycological Section of the Academy of Sciences, U.S.S.R., Leningrad, from the autumn of 1939 to the summer of 1941, showed that under local conditions leaf rust of clover (*Uromyces fallens*) [*U. trifolii*: *R.A.M.*, 25, p. 454] can overwinter by means of teleutospores and uredomycelia. Previous findings that the uredospores or underground mycelia can overwinter were not confirmed.

Jørstad (I.). **Storsopper på frukttræer og bærbusker i Norge. Ved- og barkboende Heterobasidiomyceter og Aphyllophoraceer.** [Higher fungi on fruit trees and fruit bushes in Norway. Lignicolous and corticolous Heterobasidiomycetes and Aphyllophoraceae.]—*Friesia*, 3, 5, pp. 352–376, 2 figs., 1948. [English summary.]

Of the 41 species of higher fungi comprised in this critically annotated list, the following are responsible for stem rots of living fruit trees in Norway: *Stereum purpureum* on plum (most frequently), apple, cherry, currant [cf. *R.A.M.*, 27, p. 189], and raspberry; *Laetiporus* [*Polyporus*] *sulphureus* and *Phaeolus* [*Polyporus*] *schweinitzii* on cherry; *Phellinus* [*Fomes*] *ignarius* on apple and its subspecies *pomaceus* [*F. pomaceus*] on plum and cherry; *P.* [*F.*] *vitis* on red currant and gooseberry; and *P.* [*F.*] *connatus*, which has occasionally been found on cherry and possibly on apple. Most of the other fungi occurred as saprophytes on the necrotic areas of living trees, though exceptional cases of weak parasitism were also observed.

F. igniarius, *F. pomaceus*, and *F. pinicola* are found almost exclusively in the eastern part of the country, and *F. ribis* was the only one of the fungi listed to be found north of Trøndelag. *Hirschioporus* [*Polystictus*] *abietinus* was once collected on a living cherry tree. Most of the comparatively common species under observation occurred on various fruit trees, but *Polyporus varius* was confined to apple. On the other hand, *P. varius* var. *elegans* has not been found on apple but is more prevalent than the species itself on hardwoods, especially in the north. *F. igniarius* on apple is the species itself, not the var. *nigricans*, which is common in Norway on beech and aspen. When totally resupinate *F. pomaceus* may be difficult to distinguish from *Phellinus punctatus* [*Poria punctata*].

Trametes [*Daedalea*] *confragosa* has been collected only three times in the country, the lamellate form on plum and an unidentified hardwood, and the poroid form on *Salix caprea*. Apple, pear, and cherry have been observed bearing *T.* [*Polystictus*] *versicolor* and forms of it approaching *T. zonata* [*P. zonatus*]. Three species of *Cyphella*, two on apple and one on currant, have been identified, but only tentatively, because the Cyphelloideae of northern Europe have not been adequately studied and urgently require revision.

Material of most of the collections here referred to is preserved in the Botanical Museum of Oslo University.

Fruit tree spraying trends.—*Fruitgrower*, 104, 2710, pp. 719–721, 1947.

Among the speakers at a conference on fruit spraying, organized by the Kent Agricultural Committee and the National Agricultural Advisory Service and held at Maidstone on 27th November, 1947, were M. H. Moore and H. G. H. Kearns, the former dealing with the application of sprays for the control of certain diseases and the latter with recent developments in spraying machinery.

Cherry scab [*Venturia cerasi*] may be combated by spraying early in June, and again a fortnight later, with colloidal copper (1 pint in 100 gals. water). Bacterial canker [*Xanthomonas pruni*], a very serious disease of sweet cherries, can also be

largely controlled by autumn and spring treatments with Bordeaux mixture. This schedule is less effective against the same pathogen on plums, which should be sprayed at the end of May with Bordeaux 46 in 100 and a fortnight later with colloidal copper.

Speed is the primary consideration in spraying against apple scab [*V. inaequalis*], and greater volumes and higher pressures have been urged. Some of the new sprays, though effective against the fungus, are also harmful to the trees, and their strength has had to be reduced accordingly. It was suggested that growers should use only one spray throughout the season for each part of the spray calendar. The choice of spray must depend on the conditions prevailing on individual farms.

Growers should aim at a 20 per cent. increase in spray coverage in apple pest and disease control operations. Automatic spraying at hydraulic pressure, which would obviate the existing difficulty of applying the precise amount of concentrated material required, is quite simple from the engineering point of view, but the standard trees in England present the worst possible target. Present-day planting methods are increasing the difficulty of securing a complete coverage with a machine travelling at two miles an hour with an output of 30 to 40 gals. per minute. A machine named 'Autoblast', similar to the American 'Silveraire', has been manufactured by the Kent Engineering and Foundry Co. At present the application of washes by means of manually operated lance brooms is the most efficient method of spraying. Optimum results are obtained with a broom delivering 7 to 8 gals. per minute. The full advantages of automatic spraying [*R.A.M.*, **26**, p. 307] cannot be realized on the existing layout and types of trees, on which it is impracticable to secure 100 per cent. coverage at a reasonable cost. The trees should be planted to suit the machine, e.g., in the form of hedgerows.

Plant diseases and insect pests. Notes by the Biological Branch.—*J. Dep. Agric. Vict.*, 47, 2, pp. 85–91, 6 figs., 1949.

The symptoms and methods of controlling pear black spot [scab] caused by *Venturia pirina* [*R.A.M.*, **22**, p. 91] are described together with detailed summer spray control schedules for individual varieties in order to prevent spray russet, and the method of preparing large (80 gals.) and small (10 gals.) quantities of 6–4–40 Bordeaux mixture.

Hough (L. F.) & Shay (J. R.). **Breeding for scab resistant Apples.**—Abs. in *Phytopathology*, 39, 1, p. 10, 1949.

At Urbana, Illinois, and Lafayette, Indiana, 4,664 apple seedlings resistant to scab [*Venturia inaequalis*] have been established in orchards for fruiting tests. Of these, 871 originate from crosses of 12 small-fruited *Malus* species with Wolf River or Twenty Ounce and 3,793 from crosses of resistant selections with 2-in. fruits crossed with Jonathan, McIntosh, and Delicious. All progenies were grown from seeds in the greenhouse and susceptible segregates eliminated by inoculation. Susceptible $\times$ *M. floribunda* gave a ratio of 1 resistant : 1 susceptible and *M. floribunda* selfed gave a ratio of 3:1, indicating that scab resistance in this clone is dominant and controlled principally by a single factor pair for which *M. floribunda* is heterozygous. In other species the inheritance is more complex, but segregation in crosses with commercial apple varieties is distinct and ratios appear consistent.

Morwood (R. B.). **Diseases of pome fruit in the Stanthorpe district.**—*Qd Agric. J.*, 68, 1, pp. 17–22, 3 figs., 1949.

In this survey of the nature and control of pome fruit diseases in Queensland, it is recorded that most of the cultivated apples, pears, and quinces are restricted to the Stanthorpe area on the high southern border. Owing to the dry spring weather

powdery mildew (*Podosphaera leucotricha*) [*R.A.M.*, 15, p. 103] is the main limiting factor of these crops. Jonathan and Rome Beauty apples are most susceptible, Gravenstein and Kirk David somewhat less so, while Granny Smith is practically immune. Physiological disorders of apples due to zinc, copper, and boron deficiencies [ibid., 25, p. 505] are still common.

Fleury (C.) & Mariat (F.). **Une nouvelle bactérie, hôte du Poirier : Aplanobacter fleuryi n.sp. Mariat.** [A new bacterium pathogenic to the Pear: *Aplanobacter fleuryi* n.sp. Mariat.]—*Annu. agric. Suisse*, 49, 8–9, pp. 786–789, 5 figs., 1948. [German and English summaries.]

Aplanobacter fleuryi n.sp. caused a disease of the Louise Bonne pear variety similar to fire-blight (*Erwinia amylovora*), but much less destructive, in the canton of Ticino, Switzerland, in 1946 and 1947. The non-motile rods occur singly or in pairs and measure 1 to 1·9 by 0·4 to 0·8 μ. The organism is Gram-negative, non-acid-resistant, and forms on plain agar at 23° C. (optimum 23° to 25°) smooth, glistening, sharply defined, white colonies, with a very faint yellow pigment and of a creamy consistency. It made scanty growth on Cohn's medium and Naegeli's I, and scarcely any on Uschinsky's, but it throve on Naegeli's III. Glucose and saccharose were utilized for acid and gas production, while the former only was evolved from maltose, levulose, galactose, mannose, glycerine, and starch. Starch was hydrolysed and milk slowly peptonized; gelatin was not liquefied and there was no production of hydrogen sulphide, ammonia, or indole.

A. fleuryi induced a deep necrosis in inoculated ripe pears. It made satisfactory growth on the cut surface of a piece of sterilized pear branch and traversed the conducting vessels. The bacterium also developed in moderate abundance on a filtered decoction of pear branches with the addition of agar. From these and other observations still in progress the organism appears to exert a weakly parasitic action on its host.

Dunegan (J. C.). **Prunus umbellata—a hitherto unreported host of Tranzschelia pruni-spinosae var. typica.**—*Plant Dis. Reptr*, 33, 1, p. 19, 1949. [Mimeographed.]

Uredosori and teleutosori found on *Prunus umbellata* leaves near Marshallville, Georgia, contained teleutospores corresponding to those of *Tranzschelia* [*Puccinia*] *pruni-spinosae* var. *typica* [cf. *R.A.M.*, 18, p. 322; 26, p. 113] to which the rust is referred. It is apparently the first record on this host.

Boyes (W. W.) & De Villiers (D. J. R.). **Pre-storage treatment of Peaches with acetylene gas.**—*Fmg S. Afr.*, 24, 274, pp. 9–10, 16, 1949.

Pre-storage treatment of Peregrine and Elberta peaches in 1 per cent. acetylene for 24 hours at 75° F. shortened the period of pre-storage delay necessary to eliminate woolliness [*R.A.M.*, 17, p. 470] and improved the quality of the fruit. Untreated controls which were not delayed developed 100 per cent. woolliness and were inedible.

Louw (A. J.). **Infectious chlorosis of Plums. A degeneration disease of stone fruits.**—*Fmg S. Afr.*, 24, 274, pp. 30–32, 3 figs., 1949.

During recent years plum trees at Stellenbosch, Somerset West, Paarl, Franschhoek Villiersdorp, Ceres, Ladysmith and particularly in the Paarl-Franschhoek Valley in the Western Cape Province, South Africa, have been affected by a chlorotic condition accompanied by a general deterioration. The leaves show well-defined, irregular, white to yellow spots which become necrotic and fall out, or a gradual interveinal fading of the green colour. Badly affected leaves are shed, while

new leaves appear normal. The symptoms are most evident early in the season; with the onset of warm weather in November they more or less disappear. In advanced stages the trees may have a rosetted, stunted appearance with dwarfed leaves, causing a general decline and decrease of crop. Chlorotic spots sometimes occur on the green fruit. The condition, although similar to zinc deficiency, is distinguishable from it by the mosaic patterns and the localization of the disorder to single trees or single branches.

Buds from diseased trees when grafted to healthy ones gave rise to chlorotic leaves and some sprouts from the stock in their vicinity also showed the symptoms. It is concluded that the chlorosis is caused by a virus, and the nurseries, none of which was found to be free from the disease, the main source of infection. It is probably also insect-transmissible.

Marianna plum root-stocks and other stone fruits appear so far to be unaffected. The susceptible varieties include Methley, Santa Rosa, Wickson, Gaviota, Kelsey, Golden King, Formosa, President, and Satsuma, the last being the most severely affected.

A careful inspection of nurseries and orchards for the presence of the disease, and rigorous selection of all propagation material is advised. All infected trees should be eradicated and aphids occurring on all stone fruits kept under control.

Gould (E.) & Taylor (C. F.). **Effect of insecticidal sprays on incidence of Peach scab in West Virginia.**—*Plant Dis. Reptr*, 33, 1, pp. 16–17, 1949. [Mimeographed.

In a comparative test against insect infestation carried out in West Virginia in 1948 two replicated 50-tree plots of vigorous five-year-old Elberta peaches were sprayed with various insecticides on 20th April (petal-fall), 26th April, and 10th and 24th May. For the fourth application flotation sulphur (8–100) was added to each mixture. The average percentages of fruits with scab (*Cladosporium carpophilum*) [*R.A.M.*, 26, p. 344] for acid lead arsenate plus flake zinc sulphate plus hydrated lime (2–6–8–100), the same plus parathion (½–100), and the same plus DDT (2–100), were 2·6, 5·4, and 2·8 compared with 31·8 to 65·4 for insecticide mixtures not containing lead arsenate plus zinc sulphate. The application of sulphur is usually recommended one month after petal fall and the delay in this instance permitted some scab, though infection in the lead-zinc series consisted of only very few spots per peach. Where organic insecticides are used on peach trees, careful attention should be paid to the correct timing of sulphur applications against scab.

Cation (D.). **Transmission of Cherry yellows complex through seeds.**—*Phytopathology*, 39, 1, pp. 37–40, 2 figs., 1949.

Cherry yellows is believed to represent a complex of at least two viruses, one of which induces symptoms identical with those of ring spot [*R.A.M.*, 28, p. 178], while the other component has not been determined. The disease cannot be detected in *Prunus mahaleb* except by indexing on reacting hosts, such as sour cherry varieties or peach seedlings. To ascertain the possibility of seed transmission, *P. mahaleb* and Montmorency seeds collected from known yellows-diseased trees were grown to seedling stage in the greenhouse and indexed on seedling peach in the field. The results demonstrated that at least 10 per cent. of the *P. mahaleb* seeds transmitted the ring spot virus and 8·7 per cent. the cherry yellows complex. The latter was not transmitted through the Montmorency seed in these experiments, but the ring spot virus was carried by at least 30 per cent. of the seeds. These observations emphasize the need for a disease-free source of seedlings in programmes of stone fruit virus certification, especially for cherry understocks.

Hahn (G. G.). **Evidence of the non-existence of physiological races in Cronartium ribicola.**—*Phytopathology*, 39, 1, pp. 85–86, 1949.

In connexion with Mielke's discussion of physiologic specialization in white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, 23, p. 123], a summary of accumulated data relating to the immune Viking red currant is presented [ibid., 22, p. 392]. The prolonged freedom of this variety from infection by the rust both in Europe and North America supports the argument that *C. ribicola* comprises only one race. If more races do exist, the reaction of Viking to them all is presumably identical, but many years' experience with the variety in both continents has so far failed to reveal their presence.

Pitcher (R. S.) & Webb (P. C. R.). **A fungus disease of Raspberries induced by insect attack.**—*Nature, Lond.*, 163, 4145, pp. 574–575, 1949.

Observations of raspberry canes in the field made during the last two years at East Malling showed that the midge *Thomasiniana theobaldi* utilizes normal splits in the rind for egg laying during the summer and that these areas damaged by the larvae become the sites for the raspberry cane blight organism (*Leptosphaeria coniothyrium*) [*R.A.M.*, 23, p. 234; and above p. 323]. Fructifications were commonly found on the damaged areas, but not on the surrounding healthy tissue. Tissue exposed by splits and which has not been invaded by midge tends to harden and is not attacked by fungi. It is suggested that the midge produces a substrate favourable for the development of fungal wound parasites. Evidence indicates that the midge does not introduce the spores into the splits, but rather that they are air- or water-borne.

In the same way *Fusarium culmorum* and *Didymella applanata* [ibid., 27, p. 274] enter the cane through midge-feeding lesions causing severe damage. During the summer they are more prevalent than *L. coniothyrium*.

Harris (R. V.) & Cadman (C. H.). **A.R.C. Scottish Raspberry investigation.**—*Rep. E. Malling Res. Sta., 1947*, pp. 50–52, 1948.

In further work on raspberry decline [cf. *R.A.M.*, 27, p. 246] at least ten distinct viruses or virus groups, recognizable by their symptoms on indicator hosts, have been identified on raspberries in Scotland. Evidence was also obtained indicating that a combination of two viruses of the mosaic 2 group plays a major part in producing 'symptomless degeneration'. Wild raspberries, even those remote from commercial plantations, can serve as reservoirs of virus diseases affecting commercial stocks. Leaf curl [ibid., 26, p. 160] may be due to a complex of two viruses.

The entire stock of Lloyd George, derived from parental material from New Zealand, at present being propagated in Scotland and Suffolk appears to be virus-free. Of 100 new seedlings under trial in Scotland only three show serious virus infection. Until final selections can be made, duplicates of the plants under trial are being kept in reserve for propagation. Whatever policy is eventually adopted for the commercial propagation of virus-free stocks, it is important to maintain a reservoir of one or two virus-free plants of each variety under adequate protection from infection.

Following recent outbreaks of loganberry dwarf [blackberry dwarf virus: ibid., 20, p. 69] on raspberries in the south of England watch is being kept on English stocks planted in Scotland.

Levy (B. G.). **Certification schemes for fruit plants.**—*Rep. E. Malling Res. Sta., 1947*, pp. 178–181, 1948.

Brief descriptions are given of the five separate schemes organized and conducted by the Ministry of Agriculture for the certification of nursery material of fruit plants.

The black currant scheme is compulsory [cf. *R.A.M.*, 9, p. 598; 25, p. 288]. All bushes must be true to name, free from obvious big bud [*Eriophyes ribis*] and currant reversion virus [ibid., 7, p. 182; 16, p. 822, *et passim*], and growing at least 50 yards from any reverted bushes or any plantations containing over 5 per cent. reversion. Plants are not eligible for certification until in their second year, but the sale of maidens and cuttings is allowed provided the parent bushes were certified in the year the cuttings were taken.

The strawberry 'A' or ordinary certificate [cf. ibid., 20, p. 124; 25, p. 288] is also compulsory. Parent plants and runners are inspected in September, and the certificate relates to all the runners produced in the year of inspection. Twelve varieties are named as eligible for the certificate and others are accepted under certain conditions. Where the land is liable to red core [*Phytophthora fragariae*: ibid., 23, p. 136; 27, p. 511, *et passim*] only varieties of known resistance are accepted. Plantations are judged mainly on trueness to name and freedom from virus diseases. No plantation is certified if more than a small proportion of the plants show virus symptoms. To reduce the likelihood of virus spread certain stipulations are made as to manner of cultivation.

The 'Special Stock' certificate for strawberries was introduced in 1945. This is voluntary, and only growers specializing in the raising of runners are likely to be able to fulfil the conditions. The stock must consist of runners that have received the S.S. certificate and are from one of the specified strains Royal Sovereign M. 40, Huxley Giant M. 44, Oberschlesien M. 42, Perle de Prague M. 45, and (to be added in 1949) Climax M. 46. The plants must be raised in isolation, cultivated in the 'isolated block' system, and deblossomed. Roguing must be carried out periodically and at least once in May–June when crinkle [ibid., 27, p. 140] is most obvious and again in September–October for yellow edge [loc. cit.]. The strawberry aphid [*Capitophorus fragariae*] should be kept under control. When inspected, the plants must be 100 per cent. true to type. Not more than 0·2 per cent. of the plants are allowed to be unsatisfactory from the point of view of virus infection or on general grounds. An appreciable amount of any serious disease or pest will disqualify the bed, particularly if the symptoms hinder the detection of virus. The life of the runner bed must be limited to one year.

The raspberry certificate is voluntary and confined to certain varieties. Fruiting plantations can be certified, but it is recommended that the plants should be grown in special nurseries or 'spawn beds' isolated from other varieties and fruiting plantations. Fifty feet is regarded as sufficient isolation for virus-sensitive varieties, though a greater distance is necessary for tolerant varieties. Varieties at present eligible for certification are Norfolk Giant, St. Walfried, Malling Promise, and Newburgh.

In the fruit tree rootstocks scheme most attention is directed to correct naming of the stocks. Those substantially affected by pests or diseases will not be certified.

Glover (F.). **Certification schemes for growing plants.**—*Sci. Hort.*, 9, pp. 123–126, 1949.

Brief details are given of the certification schemes for ensuring pure, healthy plant stocks at present operating in Great Britain. They comprise schemes covering potatoes [*R.A.M.*, 20, p. 624], strawberry, black currant, and raspberry plants and fruit tree rootstocks [see preceding abstract], and hop gardens [ibid., 27, p. 160].

Prentice (I. W.). **Resolution of Strawberry virus complexes III. The isolation and some properties of virus 3.**—*Ann. appl. Biol.*, 36, 1, pp. 18–25, 1 pl., 1949.

Continuing his work on resolution of strawberry virus complexes [*R.A.M.*, 27, p. 571] the author found that *Capitophorus fragariae*, after having fed for several days on a strawberry plant infected with severe crinkle, transmitted, in addition

to virus 1 [ibid., 25, p. 459], another virus (virus 3), which was separated by transferring the aphids to fresh indicators after periods of 24 hours.

Virus 3 was transmitted by aphids after six days or more infection feeding and persisted in the vector for several days; it is probable that it has a latent period of four to ten days in the vector. The symptoms produced in *Fragaria vesca* were conspicuous, scattered, interveinal chlorotic leaf spots, the centres of some becoming necrotic and red; the leaflets became twisted, downcurled, and severely distorted. Short lengths of the veins were also necrotic, being yellow or brown. On the thickened, flattened, and shortened stolons, were sometimes present greenish patches up to 1 cm. long, which often split or became necrotic. After about a month the symptoms became gradually less severe and the plants recovered slightly. Grafting and aphid transmissions of virus 3 to Royal Sovereign produced similar symptoms, which gradually lessened after some months and recurred in the early summer.

The evidence indicates that on Royal Sovereign the complex of viruses 1 and 3 causes severe crinkle and that as virus 3 is absent from plants infected with mild crinkle, these two diseases are probably etiologically distinct. The combination of virus 2 and 3 produces a form of yellow edge etiologically distinct from that caused by viruses 1 and 2 together.

Baker (R. E.) & Voth (V.). **Sample size and plot size for testing resistance of Strawberry varieties to Verticillium wilt.**—*Phytopathology*, 38, 12, pp. 1034–1036, 1948.

Of late years the development of strawberry varieties resistant to *Verticillium albo-atrum* [*R.A.M.*, 11, p. 727] has been an important objective of the University of California Agricultural College breeding programme. In 1945 it was found that the system of classification of parental material in the wilt nursery was insufficiently accurate for types with intermediate resistance. Assessments were therefore made, using plots and samples of different sizes, with selections and varieties of × *Fragaria ananassa*, which were planted in soil infested with collections of the fungus from different parts of the State and further inoculated with the pathogen at transplanting time. The results herein reported refer only to commercial varieties in 1946 and 1947. Planting was delayed until late April in each year in order to avoid infection by strawberry yellows [strawberry yellow edge virus]. In late September all the plants were classified in two groups, namely, I for plants of poor or fair resistance which were not expected to survive a second season, and II, representing good to excellent resistance, with the expectation of survival and production of satisfactory crops in the next season. The experimental varieties showed a broad range of resistance. The ratio of group I to group II plants in each variety was as follows: Lassen 1946 = 3·082:1, Shasta 1946 = 1·299:1, and Sierra 1947 = 0·0204:1. This range is typical of the commercial varieties included in the tests. The Sierra variety is so highly resistant that only 16 out of 800 plants could be placed in group I, so that the expected number of plants in this category would be too small for the sample sizes used for other varieties. In fact, Sierra represents essentially a homogeneous population of resistant plants.

In 1946, in the Lassen and Shasta varieties sample sizes of 25 and 50 plants showed the least amount of heterogeneity. Apparently the total sample size of 150 plants for plots of 50 suffices to reduce the heterogeneity to a satisfactory level (1 out of 20). For both varieties the number of random samples indicating significant heterogeneity decreases progressively through the total sample sizes of 150, 175, and 200. The homogeneity for eight plots of 25 plants falls within the commonly accepted statistical limits.

The plot sizes of 25 or 50 plants denoted a high degree of homogeneity for the variety-plot combinations. It is apparently necessary to use total samples of 150

and 200 plants for plots of 50 and 25, respectively, to reduce the discrepancy between the observed and the expected sufficiently to indicate homogeneity (19 out of 20). By designing field trials in the 'wilt nursery' to include a minimum of three plots of 50 plants or eight of 25 for all strawberry varieties and selections it should be possible to assess relatively slight differences in resistance. Determinations of this kind are necessary to evaluate the parental material used for the development of wilt-resistant varieties, and also for a study of the inheritance of wilt resistance. Sierra is the only variety with adequate resistance for profitable use in commercial plantings on wilt-infested soil.

Conover (R. A.). **A seedling blight of Avocado caused by Phytophthora palmivora.** —*Phytopathology*, 38, 12, pp. 1032–1034, 1 fig., 1948.

In October, 1947, nearly all the 4,000 avocado seedlings raised for grafting in a Florida nursery were severely attacked by a blight which precluded their use as rootstocks. All the aerial organs were involved to some extent, as well as the scions of plants already grafted. The outbreak occurred during a period of heavy rainfall and high humidity. The mature leaves bore large, irregular, reddish-brown, necrotic areas tending to enlarge most rapidly in the direction of the major veins. On the young foliage the lesions were darker, and the affected leaves were usually curled or twisted. The terminal bud was frequently killed. The dark brown, elongated, sunken spots observed only on succulent stems appeared to arise from the progress of infection into the stem from the petioles. The diseased stems often broke and sometimes the seedling died in consequence.

Isolations from the margins of diseased areas uniformly yielded pure cultures of *Phytophthora palmivora* (identified by Dr. C. M. Tucker). Inoculation experiments on unwounded avocado seedling leaves and stems resulted in the development of typical symptoms of the blight after five to seven days.

Only one other record of *P. palmivora* on avocado could be found in the available literature. Tucker [*R.A.M.*, 12, p. 594] listed it as occurring in the Philippines (*Philipp. Agric.*, 9, pp. 121–179, 1921). A perusal of the latter paper, however, showed that the species of *Phytophthora* was not designated but merely described as resembling the agent of coco-nut bud rot, cacao black rot, and the rots of various other plants. The description and illustration of the Philippine avocado seedling blight suggest its identity with the disease herein described.

Zentmyer (G. A.). **Verticillium wilt of Avocados.**—Abs. in *Phytopathology*, 39, 1, p. 26, 1949.

Verticillium albo-atrum was identified as the agent of a severe wilt and die-back of avocado in California in 1947–8. The fungus was isolated from trees of the Fuerta variety (hybrid Mexican × Guatemalan), a budded Guatemalan variety (Anaheim), and Guatemalan seedlings under conditions of natural infection. Affected trees were found on both Mexican and Guatemalan rootstocks. The first symptom is a slight foliar wilt, followed by the rapid death and brown discoloration of the leaves, which remain attached to the tree. The vascular browning usually extends from the roots to the diseased terminal branches. Some die-back occurs but new shoots usually appear following fresh xylem formation. Trees often recover completely, but may wilt again in subsequent years. Mexican and Guatemalan seedlings, inoculated by immersion of the roots in a suspension of spores and mycelium, developed wilting and foliar necrosis in a fortnight at soil temperatures of 15°, 20°, 25°, and 30° C., but not at 35°. The isolate of *V. albo-atrum* from avocado was also pathogenic to tomato. Some of the affected groves had previously been planted with tomatoes. The wilt appears to have been known formerly as 'collapse' or 'asphyxiation' and attributed to an excess of soil moisture.

Feekes (F. H.). **Onderzoekingen over schimmelbestrijdingsmiddelen. I. Sporekiemingsproeven met dithiocarbamaten.** [Studies on fungicides. I. Spore germination tests with dithiocarbamates.]—*Tijdschr. PlZiekt.*, 55, 1, pp. 22–30, 2 graphs, 1949. [English summary.]

At the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, the following derivations of dithiocarbamic acid were evaluated as protectant fungicides by the slide-germination method of the American Phytopathological Society [*R.A.M.*, 26, p. 497]. A preliminary test was carried out with aqueous solutions of ferri-dimethyl dithiocarbamate, zinc dimethyl dithiocarbamate, and tetramethyl thiuramdisulphide, using the following fungi: *Sclerotinia fructigena*, *Venturia inaequalis*, *V. pirina*, *Septoria apii-graveolentis*, *Botrytis cinerea*, *Ascochyta pisi*, *Gibberella saubinetii* [*G. zeae*], *Fusarium culmorum*, *Alternaria circinans* [*A. brassicicola*], and *Cladosporium fulvum*.

In general, mercuric chloride was the most effective of the compounds tested, while the dithiocarbamates equalled or surpassed copper sulphate. The individual fungi, however, differed in their responses to the several fungicides. In a more elaborate experiment, the above-mentioned substances, with the addition of disodium ethylene bisdithiocarbamate, zinc ethylene bisdithiocarbamate, and ethylene thiuramdisulphide, and omitting mercuric chloride, were tested against *V. inaequalis*. Tetramethyl thiuramdisulphide gave the best results, with LD 50 and LD 95 values of 0·00003 and 0·00007 per cent., respectively, compared with 0·0003 and 0·0007 per cent., respectively, for copper sulphate. Next in efficiency came ferri-dimethyl dithiocarbamate, with LD 50 and LD 95 values of 0·00008 and 0·0001 per cent., respectively, and zinc dimethyl dithiocarbamate (0·00006 and 0·0006 per cent., respectively). The other compounds were inferior to copper sulphate in their toxicity to the apple scab pathogen.

None of the dithiocarbamates used in these experiments caused at the usual concentrations any appreciable injury to tobacco, *Nicotiana rustica*, tomato, sweet peas, and *Bryophyllum pinnatum*.

Martin (H.). **Recent developments in insecticides and fungicides. Parts I & II.**—*Sci. Hort.*, 9, pp. 79–84; 143–149, 1949.

A brief account is given of advances in knowledge of fungicides from the beginning of the late war up to 1947. The materials dealt with include dispersible copper and sulphur powders, organo-mercury foliage fungicides, organic sulphur fungicides, Bordeaux substitutes, dithiocarbamates, glyoxalidines, organic mercury compounds, and antibiotics [cf. *R.A.M.*, 25, pp. 1, 401; 26, pp. 23, 63, *et passim*].

Frear (D. E. H.), Hilborn (M. T.), & Prince (A. E.). **Pest control materials, 1949.**—*Misc. Publ. Me agric. Exp. Sta.* 613 (also *Progr. Rep. Pa agric. Exp. Sta.* 4), 110 pp., 1949.

This useful publication comprises an alphabetical list of the trade names (with composition and purpose) of the pest control materials [cf. *R.A.M.*, 28, p. 183] for use during 1949, the active ingredients being listed according to their use as fungicides, herbicides, insecticides, fungicide-insecticide combinations, or rodenticides. An alphabetical list of the manufacturing companies is supplied together with a list of references to works containing additional information concerning the uses and properties of pest control materials.

Newton (W.) & Lines (C. J.). **The rooting of Cypress and Rose cuttings as influenced by arasan, fermate, and spergon, and each fungicide in combination with naphthalene acetic acid.**—*Sci. Agric.*, 28, 12, pp. 574–576, 1948.

In investigations at the Dominion Plant Pathology Laboratory, Saanichton, British Columbia, it was found that the loss of cuttings of Lawson cypress (*Chamae-*

cyparis lawsoniana var. *allumi*) was greatly diminished by dipping their bases, before planting, into fermate or spergon dusts or by immersing the cuttings for one hour in a 10 p.p.m. solution of naphthalene acetic acid [*R.A.M.*, 27, p. 281]. No satisfactory explanation can be offered as to why treatments with these dusts promoted the rooting of the cuttings to such a remarkable extent.

Sprague (R.) & Meiners (J. P.). **Some new disease records of Gramineae in the western United States. II.**—*Plant Dis. Reptr*, 33, 3, pp. 147–158, 1949. [Mimeographed.]

This is a further contribution to the list of fungi found on Gramineae in the western areas of the United States [*R.A.M.*, 27, p. 499], comprising additional records, while the publication of the complete work as one unit is awaited.

Moore (W. C.). **The incidence of plant diseases in England and Wales.**—*Sci. Hort.*, 9, pp. 85–95, 1949.

In this interesting paper the author selects some of the more familiar plant diseases found in England and Wales to illustrate how disease incidence varies from year to year and from district to district and how it may be influenced by such factors as weather and soil conditions, changing cultural practices, the exigencies of war, and by the application of new knowledge or failure to apply existing knowledge. A few of the points dealt with may be mentioned.

In surveying and measuring plant disease incidence, the first essential is accurate diagnosis, and the determination of the specific causes of 'blanks' or 'misses' which if grouped under one cause would rank very high. The relative importance and geographical distribution of the crop must also be taken into account. Some diseases may receive a great deal of prominence while others tend to be taken for granted. Thus, serious and spectacular as tomato stem rot *Didymella lycopersici* [*R.A.M.*, 25, p. 371] has sometimes been in recent years, in most outbreaks the loss does not exceed 5 per cent. of the plants.

Careful surveys of onion diseases in 1943 and 1945 have now established that the most important are downy mildew (*Peronospora destructor*) [cf. ibid., 12, p. 140; 14, p. 488; 22, p. 443], white rot (*Sclerotium cepivorum*) [ibid., 26, p. 277], and (in storage) neck rot (*Botrytis allii*) [ibid., 27, p. 462]. In years when downy mildew is not generally above normal, at least one-quarter of the onion acreage is affected by it, and about one-sixth is affected by white rot. In 1943, when neck rot was above normal, it caused a loss of one-tenth of the stored crop.

As a result of legislation and the use of resistant or immune varieties of potato, wart [*Synchytrium endobioticum*; cf. ibid., 24, p. 33] disease which during 1917 to 1922 newly infected 911 parishes, from 1923 to 1945 attacked only 278 fresh ones, an average of 12 each year. At present, some two-thirds of the potatoes grown in this country consist of immune varieties. The introduction of health certification schemes is also likely to play an important part in the reduction of disease incidence, especially as regards virus diseases. Already a marked improvement in the health of potato stocks has followed the introduction in 1931 and 1940 of schemes for certifying growing crops in respect of freedom for leaf roll and severe mosaic.

The great expansion of outdoor tomato growing from 230 acres in 1939 to 4,600 acres in 1945 has been reflected in the incidence of disease on this crop. Blight (*Phytophthora infestans*) [ibid., 25, p. 15; 26, p. 570] became a major disease on the outdoor crop and, in 1941, before spraying had become general, a severe epidemic rendered many crops useless. Fern leaf (cucumber mosaic virus) [ibid., 18, p. 783] has also become prominent on the outdoor crop, and was exceptionally prevalent in 1944, while in the last three years, early blight (*Alternaria solani*) [ibid., 24, p. 77], formerly a disease of doubtful authenticity in this country, has been responsible for widespread epidemics in the south-eastern area and the Isle of Wight.

The paper concludes with notes on diseases newly recorded in this country, or which have only recently become important, including tomato bacterial canker (*Corynebacterium michiganense*) [ibid., 26, p. 427], and downy mildew on cultivated antirrhinums (*Peronospora antirrhini*) [ibid., 17, p. 686], which was reported at Aberystwyth in 1940.

KLECZKOWSKI (A.). **The transformation of local lesion counts for statistical analysis.** —*Ann. appl. Biol.*, 36, 1, pp. 139–152, 1949.

An analysis made at Rothamsted Experimental Station of the frequency distribution of local lesions on half-leaves of *Nicotiana glutinosa* due to tobacco mosaic and tomato bushy stunt viruses and of *Phaseolus vulgaris* var. Prince due to tobacco necrosis virus, shows that their standard error increases with increasing mean. Analysis of variance and statistical tests of significance, therefore, should not be applied to lesion numbers unless they are suitably transformed. The transformation into logarithms over-corrects so that the standard error decreases with increasing mean. A satisfactory transformation is $y = \log_{10}(x+c)$, where x is the number of lesions and c is a constant. A method is given of assessing c for different experiments. Great accuracy is not necessary.

On individual plants the numbers of lesions formed on half-leaves are distributed more or less normally, whereas their distribution about the common mean for many plants is skew and 'leptokurtic'. The distribution of the transformed numbers is almost normal, both for individual plants and about the common mean for several plants.

Symposium on botanical nomenclature.—*Amer. J. Bot.* 36, 1, pp. 1–32, 1949.

This symposium comprises the following papers preceded by an introduction by E. E. SHERFF: II. Botanical nomenclature since 1867, by C. A. WEATHERBY; III. Byways of nomenclature, by S. F. BLAKE; IV. An editor's point of view, by H. W. RICKETT; V. Adventures in locating validly published but unlisted binomials, by E. D. MERRILL; VI. Toward a simple and clear nomenclature, by F. W. PENNELL; VII. Problems in taxonomy, by L. H. BAILEY; VIII. The problem of subspecific categories, by C. O. ROSENDAHL; and IX. The nomenclature of fossil plants, by T. JUST.

ARMITAGE (F. D.). **An introduction to the study of micro-fungi.**—*J. Quekett micr. Cl.*, Ser. 4, 2, 5, pp. 236–254, 4 pl., 6 figs., 3 diags., 1948.

In this paper, in which the author attempts to show that the study of mycology can be undertaken by any microscopist without a great outlay for apparatus or materials, the method of preparing culture media and mounting moulds for microscopical examination together with a list of materials required are given, and some common moulds described.

HIRSCH (HILDE. E). **The cytogenetics of sex in Hypomyces solani f. cucurbitae.**—*Amer. J. Bot.*, 36, 1, pp. 113–121, 7 figs., 11 diags., 1949.

From the results of experiments at the University of California, in which strains of *Hypomyces solani* f. *cucurbitae* [*R.A.M.*, 26, p. 162] were crossed in different combinations, it was concluded that hermaphroditic races have a haploid chromosome number of four; when such a race mutates to male, it loses one of the medium-sized chromosomes, and when it mutates to female it loses the other. The reported production of hermaphrodites and neuters from the cross female × male can then be assumed to be the result of occasional non-disjunction of sex chromosomes. Four homothallic strains of *H. solani* f. *cucurbitae* were all found to have a haploid chromosome number of six.

Snow (D.). **The germination of mould spores at controlled humidities.**—*Ann. appl. Biol.*, 36, 1, pp. 1–13, 6 graphs, 1949.

Experiments were carried out at the University of Reading to determine the minimum humidities at which the spores of different moulds isolated from feeding-stuffs [*R.A.M.*, 24, p. 381] would germinate. The results showed that those of the Mucorales and some pathogenic moulds such as *Botrytis cinerea* have very high moisture requirements (93 to 100 per cent.) for their successful germination. The spores of *Tricothecium roseum* and *Cladosporium herbarum* germinated at 90 and 88 per cent., respectively, and *Penicillium* spp. at from 80 to 100 per cent. *Aspergillus* spp. had even lower moisture requirements, the spores of the members of the *A. glaucus* group germinating at 64 to 70 per cent. (at an extremely slow rate, sometime after latent periods of two years), but active mycelial growth is not likely to be extensive under 70 per cent. *A. ruber* was the mould most resistant to low humidity conditions. The spore wall of the latter is thicker than that of the other moulds, and it is suggested that the osmotic pressure of the cell sap of the *A. glaucus* group must be much higher than for the others. There is some indication that the presence of nutrients may accelerate the rate of spore germination. After spore germination had occurred a higher humidity is necessary for the continued growth of the germ tubes; the presence of beer-wort nutrients encouraged subsequent growth and fructification. Atmospheric temperature apparently also influences the rate of spore germination and later mould development.

Freeman (G. G.) & Morrison (R. I.). **Some biological properties of trichothecin, an antifungal substance from Trichothecium roseum Link.**—*J. gen. Microbiol.*, 3, 1, pp. 60–68, 1 graph, 1949.

It seems fairly conclusive from experiments conducted at the Imperial Chemical Industries Research Department, Stevenston, Ayrshire, that trichothecin [*R.A.M.*, 28, p. 232] is responsible for the antagonism exhibited by *Trichothecium roseum* towards other fungi. Several other crystalline compounds isolated from culture filtrates of *T. roseum* were entirely devoid of antibiotic activity. Trichothecin extraction by chloroform removes the whole of the antifungal activity. Its stability suggests that it may persist in nature for a sufficiently long time to influence the growth of other fungi. The common occurrence of characteristic, virtually pure cultures of *T. roseum* on dead wood is of interest in this connexion. Concentrations of trichothecin at about 80 mg. per l. partly inhibit the growth of *T. roseum* in culture, and old cultures of the fungus gradually lose their antifungal activity.

Leontev (I. F.). Фунгицидные свойства инфузорий. [Fungicidal properties of ciliophora.]—Природа [*Nature*], 6, pp. 58–59, 1948.

Previous investigations showed that cut *Chrysanthemum frutescens* stems did not become infected with *Fusarium* in the presence of the soil-inhabiting ciliate *Colpoda saprophila*, and the same fungicidal effect of the organism was observed with water cultures of potato stems in case of *Penicillium expansum*. Furthermore, *C. saprophila* also inhibited *Bacillus* [*Erwinia*] *aroideae*.

Further experiments with other *C.* spp. showed that the living organisms as well as their culture filtrates prevented spore germination of *Verticillium dahliae*. In tests with tomato plants in nutrient solution to which (1) pseudosclerotia of *V. dahliae* and (2) pseudosclerotia and *C.* spp. were added, the former developed typical wilt symptoms in three weeks, while the latter showed no infection. It is concluded that *Colpoda* may prove useful in the biological control of pathogenic soil fungi.

Wilkins (W. H.) **Investigation into the production of bacteriostatic substances by fungi. Preliminary examination of the ninth 100 species, all Basidiomycetes.**—*Brit. J. exp. Path.*, 29, pp. 364–366, 1948.

In this study of the reaction of 112 species of Basidiomycetes to *Bacterium coli* and *Staphylococcus aureus* [cf. *R.A.M.*, 27, p. 438] the following showed 'strongly positive' anti-bacterial properties: *Corticium hydnans*, *Cyathus striatus*, *Dacromyces deliquescens*, *Daedalea confragosa*, *D. juniperina*, *Fomes annosus*, *F. juniperinus*, *F. robustus*, *Irpex obliquus*, *Lenzites trabea*, *Lycoperdon pyriforme*, *Marasmius confluens*, *M. foetidus*, *Merulius sclerotiorum*, *Odontia bicolor*, *Pholiota spectabilis*, *Polyporus castanea*, *P. fragilis*, *P. guttulatus*, and *Trametes odorata*. A further 22 species were characterized as 'weakly positive'.

Butler (Muriel) & Harris (G. C. M.). **A method for expressing numerically the morphological features of submerged cultures of fungi, with special reference to Penicillium chrysogenum, Q176.**—*J. gen. Microbiol.*, 3, 1, p. vi, 1949.

In a rapid, routine method in use at [the Imperial Chemical Industries Research Department], Manchester, for comparing the morphology of large numbers of cultures of *Penicillium chrysogenum* grown under different conditions, features which cannot be measured directly are expressed by means of numerical scales ranging from 0 to 6. Estimations for each character are guided by means of a set of standard photographs corresponding with the grades of the scale. The numerical results may be easily included in graphs or tables.

Saccas (A.). **Étude morphologique et biologique d'un nouveau champignon papyricole, le Beauveria heimii sp. nov.** [A study of the morphology and biology of a new papyricolous fungus, *Beauveria heimii* sp. nov.]—*Rev. Mycologie*, N.S., 13, 2–3, pp. 61–81, 4 figs., 1 graph, 1948.

A species of *Beauveria* was isolated in August, 1947, from a cardboard wrapping at Golfe Juan and from a book in the public library at Thiverval, Seine-et-Oise in December, 1947, on both of which it caused small spots. It has been named *B. heimii* n.sp. [without a Latin diagnosis]. It is distinguished from the five known species of *Beauveria* by its pale beige, convex, downy colonies, the difficulty of culturing it except on potato slices, and the ovoid or limoniform, slightly yellow phialospores, 3·5 by 2·8 μ. The author considers that the genus *Tritirachium* is synonymous with *Beauveria*.

Barail (L. C.). **Testing of fungicidal materials against pathogenic fungi.**—*Amer. Dyest. Reptr*, 37, 8, pp. 257–258, 281–282, 1948.

Manufacturers of hosiery, underwear, shoe and hat linings, etc., in the United States are becoming increasingly interested in the treatment of their products for the prevention of contamination by various dermatophytes. Those most commonly used in the trials of fungicides carried out by the United States Testing Company, Inc., are *Trichophyton gypseum*, *T. purpureum*, *T. sulphureum*, *Microsporum audouini*, and *Epidermophyton inguinale* [*E. floccosum*]. Of over 300 compounds subjected to very searching tests, only a few long-chain phenyl mercuric derivatives satisfied all the requirements in respect of non-toxicity, lack of objectionable colour or odour, ready miscibility and compatibility with various materials, ease of application, and so forth, while the fungicidal properties of one of them were definitely outstanding.

Krishnaswamy (M. A.). **Microflora of Indian butter. I. Distribution of numbers and groups of micro-organisms.** –*Indian J. Dairy Sci.*, 1, 4, pp. 127–129, 1948.

Among the organisms isolated from butter samples at the Indian Dairy Research Institute, Bangalore, were a number of species of *Oidium*, *Penicillium*,

Cladosporium, *Aspergillus*, *Mucor*, *Trichothecium*, and *Fusarium* [cf. *R.A.M.*, 27, p. 535].

Symposium held on yeasts in feeding.—*Brew. Dig.*, 23, 11, pp. 148–151; 12, pp. 163–165, 1948.

Abstracts are given of 28 papers presented at a conference held at Milwaukee, Wisconsin, from 8th to 10th November, 1948, covering all aspects of yeast biology, production, and utilization [*R.A.M.*, see above, p. 311]. The titles include 'Food-yeast production from wood-processing by-products' by E. E. Harris; 'The production of yeast from agricultural wastes' by W. D. Ramage and J. H. Thompson; 'Utilization of yeast in chicken and turkey diets' by J. McGinnis (dealing with *Torula* [*Torulopsis*] *utilis*); 'Taxonomy and morphology of yeasts' by E. M. Mrak; 'Ecology and distribution of yeasts' by H. J. Phaff; 'Genetics and hybridization' by C. C. Lindegren and Gertrude Lindegren [ibid., 28, p. 298]; and 'New methods in taxonomic study and maintenance of culture collections' by L. J. Wickerham, K. A. Burton, and R. J. Gill. It is planned to publish the full texts of these papers in the proceedings of the conference.

Petersen (H. I.) & Thorup (S.). **Deformiteter, fremkaldt af hormon-præparater, kan forveksles med angreb af skadedyr eller plantesygdomme.** [Deformities induced by hormone preparations may be confused with pest attack or plant diseases.]—Reprinted from *Ugeskr. Landm.*, *1949*, 7, 4 pp., 7 figs., 1949.

The treatment of cultivated plants with growth substances, in connexion with weed control experiments in Denmark, has been observed to induce various deformities which might readily be confused with the symptoms of insect infestation or pathogenic fungi and viruses. Among the examples cited may be mentioned beets reacting as if damping-off; swedes with symptoms like club root [*Plasmodiophora brassicae*]; and potatoes with virus-like symptoms.

Perlman (D.). **Effects of minor elements on the physiology of fungi.**—*Bot. Rev.*, 15, 3, pp. 195–220, 1949.

Methods of purifying culture media are described together with the results of published observations on the effects of metallic ions on the growth and metabolism of certain fungi [*R.A.M.*, 27, p. 291].

Sempio (C.). **Respirazione, glicolisi e traspirazione nel corso del parassitamento.** [Respiration, glycolysis, and transpiration during parasitism.]—Reprinted from *Ann. Fac. agr. Perugia*, 1, 15 pp., 16 graphs, 1942. [Received March, 1949.]

As the result of further studies on the effect of various factors on parasitic diseases of cultivated plants [cf. *R.A.M.*, 18, p. 48] carried out at the Istituto di Patologia Vegetale, Perugia, during 1942, the author presents the results of experiments to determine the effect of parasitism on respiration, glycolysis, and transpiration of Cinquantino Giallo beans [*Phaseolus vulgaris*] infected with *Uromyces appendiculatus* [loc. cit.], Nostrale (Umbra) beans [*Vicia faba*] infected with *U. fabae* [ibid., 28, p. 45], Nera da Inverno lettuces infected with *Bremia lactucae* [see next page], and preliminary results with wheat infected with *Oidium* [*Erysiphe graminis*: see below, p. 351] and *Puccinia triticina* [ibid., 25, p. 551]. These experiments showed that infection exerted a much more marked influence on respiration than on glycolysis and transpiration. A marked increase occurred in the respiration of infected plants as compared with the controls, the maximum increase usually taking place at the time of the formation and eruption of the uredosori or of the formation and emission of the first conidiophores. On the whole glycolysis did not appear to be influenced by disease development. The water content or quantity of water lost

by transpiration in infected plants as compared with healthy ones varied with each disease.

Sempio (C.). **Comportamento di alcune fra le principali attività enzimatiche durante il periodo del parassitamento. (Nota preventiva sulla ruggine del Fagiolo).** [Some of the chief enzymatic activities which occur during parasitism. (Preliminary note on French Bean rust.)]—Reprinted from *Ann. Fac. agr. Perugia*, 1, 6 pp., 1942. [Received March, 1949.]

Continuing his studies on metabolic changes that occur in the plant during parasitism [see preceding and next abstracts] the author gives the results of preliminary observations on the sugar content and the amylolytic, lipolytic, and proteolytic activities of bean [*Phaseolus vulgaris*] plants during the development of rust [*Uromyces appendiculatus*], from the initial infection to spore maturity. During the first four to six days after infection the sugar content of the juices was notably higher in infected plants than in the controls. Then a rather rapid decline occurred so that ten to twelve days after infection it was notably lower than in the healthy controls. The lipolytic and particularly the amylolytic activity was generally higher in infected plants, a maximum intensity being reached about five to six days after infection when values twice as high as those in the controls may be obtained. In general the proteolytic activity was slightly higher in infected plants although irregularities occurred fairly frequently.

Sempio (C.). **Influenza di alcuni glucidi isomeri sullo sviluppo della ruggine del Fagiolo e di altre malattie fungine.** [The influence of some isomeric saccharides on the development of French Bean rust and other fungal diseases.]—Reprinted from *Riv. Biol.*, 34, 7 pp., 1942. [Received March, 1949.]

The results are given of experiments made at the Istituto di Patologia Vegetale, Perugia, to determine the influence of certain mono- and disaccharides on the development of *Uromyces appendiculatus* in artificially infected Cinquantino Giallo beans [*Phaseolus vulgaris*: see preceding abstracts], of rust [*Uromyces fabae*] in broad beans, and *Peronospora* [*Bremia lactucae*] in lettuce. In all cases the cut leaves of infected plants were soaked in the various sugar solutions.

The average of the results of eight tests were as follows: for *U. appendiculatus* glucose, laevulose, and saccharose were associated with marked or strong attacks; galactose, lactose, xylose, mannose, and maltose with generally moderate attacks; arabinose and sorbose with attacks that were usually very slight. With water the attacks (if any) were very slight. In the last two cases abortive pustules were frequently observed. Although with *U. fabae* and *B. lactucae* the results were less consistent and significant it was found that saccharose, glucose, and laevulose seemed most utilizable by *U. fabae* followed by mannose, lactose, and xylose while *B. lactucae* made use of saccharose, lactose and glucose, followed by laevulose and galactose, and then by xylose.

Sempio (C.). **Influenza dell' oscurità sulla respirazione e sulla glicolisi di alcune piante in rapporto alla loro resistenza a parassiti obbligati.** [The effect of darkness on respiration and glycolysis in certain plants in relation to their resistance to obligate parasites.]—Reprinted from *Riv. Biol.*, 35, 10 pp., 1943. [Received March, 1949.]

Continuing his earlier experiments [*R.A.M.*, 18, p. 471], the author carried out similar tests with healthy wheat and lettuce seedlings. The plants were kept in complete darkness (the controls being exposed to ordinary daylight). The data obtained demonstrated that after 24 hours' exposure to darkness the tissues of the healthy plants showed not only arrest of photosynthesis but also a distinct reduction in respiratory and glycolytic activity, the values for the last-named falling as low

as one-third of the normal figure. It would therefore appear that the reduced resistance noted when lettuce plants infected with *Bremia lactucae* and wheat with *Erysiphe graminis* [cf. ibid., 26, p. 296 and next abstract] are exposed to darkness during the first phase of infection is associated with marked reduction of metabolism, especially glycolysis. In the cases studied it would appear that glycolytic activity is very closely related to the mechanism of resistance, and may be taken as an indication of the defensive capacity of the host.

The marked reduction in infection noted when diseased plants are exposed to darkness in the third phase of infection would seem to be due mainly (apart from the arrest of photosynthesis and the decline in glycolysis) to the considerable reduction in respiration which occurs at the time when normally the respiratory rate increases just before spore formation.

Sempio (C.). **Sulla resistenza metabolica in patologia vegetale.** [On metabolic resistance in plant pathology.]—*Riv. Biol.*, 38, pp. 191–196, 1946. [Received March, 1949.]

The available evidence appears to indicate that plants show three forms of metabolic resistance to infection, (1) through stimulation of the functions, especially the processes of synthesis (photosynthesis), (2) through a change in the equilibrium of the relations that normally exist between the intensities of such functions, and (3) through the substitution of certain compounds readily assimilable by the parasite by their isomers, which are easily used by the plant but which cannot be used at all, or to only a very slight extent, by the parasite.

Groups 1 and 2 are illustrated by the author's studies of the infection of wheat seedlings by *Erysiphe* [*graminis*: *R.A.M.*, 26, p. 50 and preceding abstract].

The stimulation of respiration, glycolysis, and especially photosynthesis, during the first days' incubation of the disease must be regarded as a defensive reaction on the part of the plant to the incipient attack on the fungus.

In support of the hypothesis of isomeric variations in the host tissues it was found that bean [*Phaseolus vulgaris*] leaves inoculated with the uredospores of *Uromyces appendiculatus* and kept in the dark in distilled water for ten days were yellow and necrosed but showed no trace of infection, doubtless because owing to sugar denutrition the parasite had been unable to grow. Leaves kept in 1 per cent. laevulose were green and in fairly good condition, but a large part of them bore uredosori, i.e., the laevulose had been utilized by both leaf and parasite. The leaves kept in 1 per cent. sorbose appeared almost normal with only traces of uredosori, nearly all of which had aborted. In this case, evidently, only the leaf had been able to utilize the sugar.

Lutz (J. M.), Wright (R. C.), & Edgar (A. D.). **Research on harvesting, transportation and storage of Potatoes—a review of recent literature.**—*Amer. Potato J.*, 25, 12, pp. 437–445, 1948.

Recent work published since January, 1945, on the following physiological disorders affecting potatoes in storage is briefly summarized: internal mahogany browning [*R.A.M.*, 27, p. 92], stem-end browning [ibid., 25, p. 573], internal black spot [ibid., 25, p. 276], and greening of tubers (*Amer. Potato J.*, 24, pp. 336–340). The pathogenic diseases include blight [*Phytophthora infestans*: *R.A.M.*, 25, p. 276], *Fusarium* seed-piece decay [*F. caeruleum*, *F. sambucinum* f. 6, and *F. solani* var. *striatum*: ibid., 25, p. 331], and ring rot [*Corynebacterium sepedonicum*: ibid., 27, p. 91].

Hoyman (W. G.). **Potato-fungicide experiments in 1948.**—*Bi-m. Bull. N. Dak. agric. Exp. Sta.*, 11, 2, pp. 32–35, 1948.

The 1948 potato fungicide experiments were carried out in a 160-acre field of

Cobbler potatoes at Northwood, North Dakota, using 16 different treatments for control of *Alternaria solani* and *Phytophthora infestans* [*R.A.M.*, 28, p. 140]. As the incidence of these diseases was slight yield data only were taken. Among the dusted plots, those treated with parzate, zerlate, and Z-78 plus 5 per cent. DDT gave the highest yields (314·6, 295·7, and 295·1 bush. per acre, respectively). Plots sprayed with dithane D-14, parzate, zinc nitrodithioacetate, tribasic-nu-Z, and copper-zinc chromate gave considerably higher yields than the control plot (5 per cent. DDT) or the plot sprayed with tribasic copper sulphate. The yields from plots sprayed with zinc sulphate were comparable to some of the high-yielding plots which received zinc-containing fungicides. The plot sprayed with tribasic-nu-Z yielded 30·9 more bushels per acre than that sprayed with tribasic copper sulphate. The vines of rows receiving zinc-containing materials had greener and more luxuriant foliage than the control plots or those receiving copper-containing fungicides.

Thurston (H. W.), Leach (J. G.), & Wilson (J. D.). **Chromates as Potato fungicides.**—*Amer. Potato J.*, 25, 11, pp. 406–409, 1948.

Further comparative field tests with copper zinc chromate [*R.A.M.*, 28, p. 140] at 2 lb. per 100 gals. (approximately 3 copper : 2 zinc : 1·2 chromium) were conducted on several potato varieties in Pennsylvania, West Virginia, and Ohio, in areas where early and late blights [*Alternaria solani* and *Phytophthora infestans*] were important yield-reducing factors.

In 1946 copper zinc chromate produced the highest yields in two, zerlate in two, and Bordeaux in one of five trials. The chromate gave the best control during a severe outbreak of late blight in West Virginia, with a rating of 43, compared with 57, 84, 85, and 119, for tribasic, dithane, Bordeaux, and control, respectively.

In 1947 the chromate and dithane each produced the highest yields in three trials out of seven and an alternating schedule of zerlate and parzate in one. In a very severe outbreak of *A. solani* in Ohio, there were 76 per cent. of living plants and a yield of 586 bush. after chromate, the corresponding figures for dithane, Bordeaux, and the control being 57 and 540, 55 and 491, and 30 and 365, respectively.

Rich (A. E.). **Varietal resistance to Potato late blight in western Washington in 1948.**—*Plant Dis. Reptr*, 33, 1, p. 11, 1949. [Mimeographed.]

During 1948, climatic conditions in western Washington were very favourable for the development and spread of potato blight (*Phytophthora infestans*), and some growers who failed to carry out a satisfactory spray or dust programme sustained nearly 100 per cent. loss. The potato variety trial plots at Mt. Vernon received two combination insecticide-fungicide dustings early in the season, but no further blight control treatment. On 30th August, the amount of foliage killed by the disease on each variety (average of 25 hills) was, a trace for Ashworth [*R.A.M.*, 27, p. 539], Essex, Glenmeer, and Calrose [ibid., 26, p. 211], and 5 per cent. for Chenango, Cortland, Harford, Kennebec [ibid., 28, p. 139], Placid, and Snowdrift, other varieties having 10 to 95 per cent. In an adjacent block given no fungicidal application, Mohawk showed only 15 per cent. defoliation, in contrast to 95 per cent. on Russet Burbank.

Martin (W. J.). **Strains of Phytophthora infestans capable of surviving high temperatures.**—Abs. in *Phytopathology*, 39, 1, p. 14, 1949.

In an attempt to explain the unusual occurrence in recent years of blight (*Phytophthora infestans*) in the Louisiana autumn potato crop a study was made of the reaction of eight isolates of the fungus to high temperatures. Cultures on navy bean infusion agar were exposed at 36° C. for varying periods, after which they were kept at 20° for several days; transfers were then made to determine whether

they were still viable. The maximum length of survival by the four Louisiana isolates was six days, compared with four for the three strains from Minnesota and less than six hours for the one from Cornell [New York].

Stevenson (F. J.) & Livermore (J. R.). **The Saranac Potato: a new variety promising in Australia.**—*Amer. Potato J.*, 26, 2, pp. 45–46, 1949.

U.S.D.A. Seedling No. 336–144 [*R.A.M.*, 27, p. 38], sent to the Department of Agriculture, Sydney, Australia, in 1938, has been found very promising in certain parts of Australia, and at the request of the Department of Agriculture, Sydney, has been named Saranac. It is a selection from a cross of President × Katahdin. In nine years' field tests in Maine, Saranac showed an intermediate resistance to blight [*Phytophthora infestans*] similar to that of the President parent [ibid., 16, p. 54]. It is resistant to ring rot (*Corynebacterium sepedonicum*) [cf. ibid., 22, p. 37], but was found highly susceptible to leaf roll in New York State and Maine.

Schaal (L. A.). **The reaction of Pawnee and Bliss Triumph Potatoes to certain physiologic races of Actinomyces scabies.**—*Amer. Potato J.*, 25, 12, pp. 427–431, 1 fig., 1948.

In Colorado, Pawnee and Bliss Triumph potatoes are susceptible to many races of *Actinomyces scabies* [*R.A.M.*, 24, p. 113]; occasionally the former has been free from scab, while the latter, growing in the same soil, was severely infected. Greenhouse inoculation experiments with four isolates of the fungus showed that Pawnee was resistant to two races that caused deep pustules on Bliss Triumph, while a race causing an intermediate type of scab on Pawnee did not affect Bliss Triumph.

Perrault (C.). **Études sur la pourriture du cerne des Pommes de Terre causée par Corynebacterium sepedonicum (Spieck. & Kott.) Skaptason & Burkholder. I. Les agents de dissémination.** [Studies on Potato ring rot caused by *Corynebacterium sepedonicum* (Spieck. & Kott.) Skaptason & Burkholder. 1. Means of dissemination].—*Sci. Agric.*, 28, 6, pp. 244–260, 1 graph, 1948. [English summary.]

The results of experiments carried out in the province of Quebec since 1937 showed that potato ring rot (*Corynebacterium sepedonicum*) [*R.A.M.*, 27, p. 537; 28, p. 141] is disseminated chiefly by infected seed tubers, cutting knives [ibid., 26, p. 211], planting and digging machines, and various containers such as sacks and baskets, in descending order of importance. Apparently healthy tubers from an infected crop planted on two farms yielded crops with 59 and 52 per cent. ring rot, respectively, compared with 2 per cent. in plants grown from certified seed. A higher rate of infection resulted when small tubers were planted than with large, but much less infection resulted from planting small whole tubers than from larger cut tubers.

The results of experiments with an infected cutting knife showed that ring rot was transmitted to the hills up to the twentieth cut tuber. In some cases, however, the disease was transmitted no further than the twelfth and thirteenth cut tubers.

Ring rot occurred on potato plants even after the planting machine had been disinfected, indicating that it is inadvisable to use machines which have been in contact with a diseased crop.

Experiments in which seed pieces were carried to the field in infected paper bags, indicated that ring rot can be transmitted by mere contact with a contaminated surface and that in some cases the pathogen is still virulent after exposure for several months at unfavourable temperatures.

Volunteer plants may become a source of infection when the same field is planted with potatoes for two consecutive years, especially when the first year's crop is infected.

Although organisms resembling *C. sepedonicum* were observed in a few types of insects commonly feeding upon infected potato plants, no evidence was obtained as to the transmissibility of the disease through such means. Under the climatic conditions of the province no soil transmission was obtained.

It is evident, therefore, that losses from ring rot can be considerably reduced, provided that the seed tubers are not infected, if the grower takes steps to eliminate dissemination by the various agents [ibid., 25, p. 317].

PERRAULT (C.). **Études sur la pourriture du cerne des Pommes de Terre causée par Corynebacterium sepedonicum (Spieck. & Kott.) Skaptason & Burkholder. II. Les moyens de lutte.** [Studies on Potato ring rot caused by *Corynebacterium sepedonicum* (Spieck. & Kott.) Skaptason & Burkholder. II. Control methods.]—*Sci. Agric.*, 28, 11, pp. 518–530, 1948. [English summary.]

Further studies on the control of potato ring rot (*Corynebacterium sepedonicum*) [see preceding abstract] in Quebec have shown that disinfection of tubers, either whole or cut, is not a completely effective means of controlling the disease. Formalin (10 per cent.) and mercurnol (6 oz. mercuric chloride in 1 pint hydrochloric acid and used at 1 per cent.) [*R.A.M.*, 20, p. 176] proved most efficient among the various disinfectants tested, reducing the percentage of wilted plants from 84 to 12 and 4, respectively. A 5 per cent. lysol solution was completely effective but injured the setts. In almost every case a delay of a few hours in disinfecting potato setts cut with a knife contaminated with the organism increased the amount of disease in the field. Contaminated knife blades were not satisfactorily disinfected after immersion in 20 per cent. alcohol for from one to five minutes or in formalin for one or two minutes. In order to remove all bacteria, the blade used to cut stems and tubers in making smears for microscopical examinations must be flamed until red hot or washed under running water.

Potato setts, freshly cut with an infected knife and exposed to the sun for a few hours, tended to have less infection than similar tuber pieces not so exposed. Although roguing is a slow and impracticable method of control, the disease may be completely eliminated from a lot of potatoes if planted by the tuber-unit method and rogued, provided that every precaution of sanitation is taken.

Of the varieties tested for resistance to the disease, only Rural Blush, President, and Dakota Red showed any promise.

SMITH (W. L.). **Some specific characters of Erwinia atroseptica and Erwinia carotovora.**—Abs. in *Phytopathology*, 39, 1, pp. 22–23, 1949.

Most of the 58 isolates of the *Erwinia* soft rot group [*R.A.M.*, 23, p. 335; 27, p. 513] used in these studies originated during the last two years in various decaying vegetables or in the tissues of potatoes affected by black leg [see above, p. 306]. The group was divided into two species, *E. carotovora* and *E. atroseptica* [*E. phytophthora*], which reacted differently in culture, mainly in their utilization of certain carbon compounds in synthetic media. *E. carotovora* utilizes ethyl alcohol (5 per cent.), dulcitol (1 per cent.) and uric, hippuric, and malonic acid sodium salts at 0·15 per cent. These compounds are not assimilated by *E. phytophthora*. Both species throve on a medium containing 1 per cent. maltose, on which, however, *E. phytophthora* produced stronger acid than *E. carotovora*. Potato slices were rotted by all the isolates, but only those of *E. phytophthora* induce black leg in potato plants. When seed pieces were cut from healthy tubers with a knife inoculated with cultures of the latter organism and planted some decayed, resulting in missing hills, while others gave rise to diseased plants. Infection by *E. carotovora* was not transmitted in this manner. It is concluded that the black leg pathogen, *E. phytophthora*, should be maintained as a distinct species from the soft rot organism, *E. carotovora*.

Mallamaire (A.). **Maladies, plantes parasites et plantes infestantes des Riz cultivés en Afrique occidentale.** [Diseases, plant parasites, and weeds of Rice grown in West Africa.]—*Agron. trop.*, 4, 1–2, pp. 77–80, 1 fig., 1949.

Rice plants growing in [French] West Africa are frequently attacked by *Sclerotium oryzae* [*Leptosphaeria salvinii*: see next abstract] and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, 26, p. 236; C.M.I. map 92]. For control of the latter avoidance of excess nitrogenous fertilizers, provision of adequate potash, leaving the infected areas as ploughed fallow or as pasture, and seed disinfection in 0·35 per cent. formol or 0·03 per cent. mercuric chloride, both for 24 hours, or 50 gm. ceresan in 10 l. water for 100 kg. paddy, steeping for 15 minutes are recommended. Blast caused by *Piricularia grisea* [? *P. oryzae*; ibid., 15, p. 779; I.M.I. map 51] was reported from the Ivory Coast in 1936 and in 1937 from the Basse Côte. *Sphacelia oryzae* or 'false ergot' is rare; in 1936 it caused about 5 per cent. infection in the Kankan area of French Guinea. *Ustilaginoidea virens* [ibid., 26, p. 125] occurs sporadically in French Guinea and the Ivory Coast. Scald is generally due in part to fungus attacks and is characterized by panicles containing whitish, empty grains.

Bouriquet (G.). **Les maladies cryptogamiques et les principaux ennemis végétaux et animaux du Riz à Madagascar.** [Fungal diseases and the principal plant and animal pests of Rice in Madagascar.]—*Agron. trop.*, 4, 1–2, pp. 81–89, 9 figs., 1949.

This is a survey of the most important diseases of rice in Madagascar [cf. *R.A.M.*, 27, p. 79] as a result of 15 years' study.

In 1935 serious but limited damage was incurred near Arivonimamo by a fungal pathogen causing rapid wilting and death of affected plants. The collar region, which was abnormal in colour, yielded a hyaline, septate mycelium bearing cylindrical conidia nearly 10 μ long. When kept moist the diseased tissue rapidly developed septate, crescentic, conidia, typical of the genus *Fusarium*, and measuring 14 to 31 by 2 to 4 μ. Similar damage has not occurred since in this area. Plants are most susceptible to attack by *Leptosphaeria salvinii* [ibid., 28, p. 29 and preceding abstract] after pricking out. Yellow, wilting tissues are especially favourable for the survival of the fungus as a saprophyte. The sclerotia, which occur more frequently than the fruiting bodies of the other states of the fungus, are capable of surviving for three years on rice straw at 20° C. At temperatures up to 35° the duration of viability is progressively reduced. The influence of temperature is also apparent in water and in the soil. In general the sclerotia survive for about six months in submerged rice fields. Sunlight, or probably the ultra-violet rays, could kill them within a month. Although not a virulent parasite, *L. salvinii* is capable of causing appreciable damage to rice crops and its presence should not be neglected.

False smut caused by *Ustilaginoidea virens*, observed only in the region of Fénérive where it causes very little damage, forms large brown masses of false tissue between the glumes. Brown, spherical, finely echinulate spores measuring about 6 μ in diameter develop on the surface of the sclerotia.

A species of *Cephalosporium* [? *C. oryzae*: ibid., 20, p. 447] causing grain failure has been reported from the region of Marovoay. Brown spots with clear centres appear on the glumes, mostly opposite the peduncle. The fungus produces cylindrical conidia measuring about 6·5 by 1·5 μ on the anthers. Different degrees of susceptibility were exhibited by the various varieties towards this organism which may play only a secondary part. The disease is found chiefly on newly cultivated land relatively lacking in phosphorus and on which pricking out has been delayed.

Olson (E. O.), & Martin (W. J.). **Relationship of Ceratostomella fimbriata from the Hevea Rubber tree and Sweet Potato.**—Abs. in *Phytopathology*, 39, 1, p. 17, 1949.

Self-fertile (perithecial) cultures of *Ceratostomella fimbriata* isolated from *Hevea* rubber in Mexico [*R.A.M.*, 26, p. 417] and sweet potato in the United States [ibid., 23, p. 499 *et passim*] were very similar morphologically, but the former were not pathogenic to sweet potato or the latter to rubber. Both strains gave rise to self-fertile and self-sterile strains among single ascospore cultures isolated from them. When a week-old culture of a self-sterile sweet potato strain was spermatized with spores from a self-fertile rubber culture, perithecia developed within three days. The ascospores from these perithecia, however, germinated very poorly, only two out of 300 producing cultures, which were self-fertile. One was pathogenic to both hosts and the other to rubber only. Ascospores isolated from the two cultures yielded self-fertile and self-sterile strains with the same pathogenicity as the parent. The evidence from these experiments indicates that hybridization occurred between the sweet potato and rubber forms of *C. fimbriata*.

Kevorkian (A. G.). **Bird's eye spot disease of Hevea Rubber in Nicaragua.**—*Phytopathology*, 38, 12, pp. 1025–1027, 1 fig., 1948.

In October, 1943, following a three-week drought, a severe outbreak of bird's eye spot (*Helminthosporium heveae*) occurred on *Hevea* rubber [*R.A.M.*, 26, p. 417] in the nurseries of eastern Nicaragua. The circular lesions on the leaf blades, ranging from pin-point size to 5 or 6 mm. in diameter, are dark purple at first but as they enlarge the margins turn paler and the central portion appears greyish-white. In heavily infected leaves the spots coalesce and form irregular patterns. Lesions were also formed in profusion on the succulent growing tips of four- to six-week-old seedlings, while juvenile foliage commonly bore slightly elongated spots on the midrib and petioles. Advanced symptoms of bird's eye spot include a tendency to distortion and concave cupping of the young leaves, with death of the tips and margins, followed by excision of these parts. Severe infections cause the abscission of the top 'flush' of juvenile foliage. In older leaves the central dead areas of the leaves drop out.

In the nurseries inspected the number of lesions per leaflet ranged from 29 to 681, and the disease involved over 500,000 1- to 14-month-old seedlings covering several acres. In one bed all the 242 five-month-old plants were attacked, and 7·4 per cent. had lost all the leaves of the top 'flush'. In an adjacent clonal garden several varieties reputed to give high latex yields were also susceptible to the leaf spot, though less so than the seedlings, possibly on account of the wider spacing in the garden. The number of lesions on the clones ranged from a minimum of 13 in GV.-42 to a maximum of 64 in GA.-49.

A large-scale budding programme was in progress in the Nicaraguan nurseries, and in a trial where 100 plants with defoliated top 'flushes' and the same number of slightly infected plants with the leaves retained were budded under identical atmospheric conditions, the successful results were four times greater in the latter than in the former.

Nicholas (D. J. D.). **The application of rapid chemical tests to the diagnosis of mineral deficiencies in horticultural crops. I. Crops grown on a manurial trial. II. Crops grown at various centres.**—*J. hort. Sci.*, 24, 2, pp. 72–105, 6 diags., 102 graphs; pp. 106–122, 1948.

A detailed description is given of a rapid chemical tissue test method [cf. *R.A.M.*, 25, p. 576] used to diagnose mineral deficiencies in potato (two varieties) and cauliflower, grown on a long term manurial trial. The procedure comprised a specialized

method of sampling fresh plant material, followed by the extraction of the easily soluble nutrients from selected portions of the plants, and their subsequent estimation by colorimetric and turbidimetric tests. A buffered solution of 100 gm. sodium acetate and 30 ml. glacial acetic acid in 1 l. distilled water at pH 4·8 was used to extract the nutrients from weighed quantities of fresh tissue for 15 minutes. The nutrient standards fixed for the various elements in a number of plants are given and also threshold deficiency values coinciding with visual symptoms of the respective deficiencies. The tissue test data reflected manurial and cultural treatments, agreed with the visual diagnosis, and showed a close correlation with the full chemical analyses over a range of values useful for diagnosis of deficiencies.

Tissue tests used for diagnostic purposes must be related to the seasonal cycles of the various nutrients for particular crops. Nitrate nitrogen fell continuously as the season progressed, and towards the end the nitrate test could not be used. With a knowledge of these cycles, however, it was possible to use the method to anticipate deficiencies and toxicities which became visible only at a later stage.

Field data for potatoes indicated that potassium and nitrogen deficiencies significantly reduced crop weight. With cauliflowers, nitrogen deficiency was mainly responsible for low yields. These deficiencies were indicated early in the season by chemical tissue tests.

At the higher nutrient levels in non-deficient plants the tissue test method did not always distinguish the differences revealed by full analyses. Comparisons suggest that the tissue test method can replace the longer procedure for rapid diagnosis. Because of its speed, facility, and suitability for field purposes the tissue test method is particularly valuable for advisory and survey work. A bibliography of 51 references is appended.

In the second paper it is stated that when the tissue test method was applied to the diagnosis of mineral deficiencies and manganese and chloride toxicities in crops at widely different centres, the results reflected the manurial treatments given, whether soil treatments or foliage sprays. The data agreed well with those given by the visual method, the tissue test being found of particular value when visual symptoms were obscure. This was demonstrated in (*a*) acidity complex in potato, where potassium, magnesium, calcium, phosphorus, and nitrogen deficiencies occurred in conjunction with manganese toxicity, (*b*) potassium deficiency and chloride toxicity in black and red currant, and (*c*) potassium and magnesium deficiencies in apples.

With all crops studied a close correlation was obtained between tissue test and ash analysis data over the diagnostic range for deficiencies and toxicities.

Nicholas (D. J. D.). **Rapid tissue tests for mineral nutrients in plants.**—*Sci. Hort.*, 9, pp. 50–54, 1949.

The author briefly describes the technique for making rapid chemical tissue tests of fresh plant material for the presence of mineral nutrients [see preceding abstract], discusses the diagnostic value and limitations of the method, and states that there is nearly always a very close correlation between the results obtained and the visual signs of nutrient deficiency or toxicity. The technique is invaluable for rapid diagnosis, and is particularly useful where the visual symptoms are not well defined or are masked by fungal, insect, or virus attack.

Roach (W. A.). **Plant injection methods.**—*Sci. Hort.*, 9, pp. 55–61, 1 pl. (facing p. 96), 1949.

The author gives a brief, general account of plant injection methods for the diagnosis of mineral deficiencies and discusses some typical results obtained

by the method at home and overseas [*R.A.M.*, 25, pp. 98, 119, 124; 26, p. 554].

Hewitt (E. J.). **The relation of manganese and other metal toxicities to the iron status of plants.**—*Brit. Sci. News*, 2, 16, pp. 116–119, 5 figs., 1949.

The nutritional factors contributing to iron deficiency in plants are discussed, particularly the toxic effects of manganese and other metals [*R.A.M.*, 27, pp. 336, 583]. Further toxicity studies at Long Ashton Research Station, Bristol, using sugar-beet, potato, oat, and kale seedlings in sand cultures to which various metals (at 0·5 milli-equivalents per l.) were added showed that in addition to the elements already listed cadmium and the chromate ion induce severe chlorosis, vanadate and molybdate moderate chlorosis, while with titanium and arsenate the chlorosis is as slight as with manganese. After discussing possible mechanisms the author concludes that the simultaneous presence of iron and manganese deficiency symptoms in the same plants indicates some independent functions for these elements, a view supported by the visual distinction between manganese toxicity and induced iron deficiency. As the functional status of ferrous and ferric iron in chlorophyll formation is not yet elucidated, the cause of induced iron deficiency symptoms cannot yet be specified in terms of this equilibrium. It appears that more than one mechanism may be involved.

Keyworth (W. G.). **Verticillium wilt of the Hop (Humulus lupulus). IV. Study of a fluctuating outbreak.**—*J. hort. Sci.*, 24, 2, pp. 149–156, 2 diags., 1948.

In further studies of hop *Verticillium* wilt (*V. albo-atrum*) [see above, p. 308] the author investigated a mild outbreak of the fluctuating type to determine where infected cuttings occurred in a field in relation to the distribution of visibly affected plants. The field selected (in Kent) contained in 1943 a number of plants with mild symptoms, externally only a thickened, corky appearance of the bine in most cases. During the winter of 1943–4 all those cuttings which would normally be used for propagation were taken from selected plants in the following categories: (*a*) 32 plants visibly diseased, (*b*) 32 adjacent to these, (*c*) 32 in the vicinity of, but not adjacent to (*a*), and (*d*) 64 in an apparently healthy area of the field and some distance away from (*a*). Isolations showed that 95 of 216 cuttings and 29 of the plants in category (*a*), 24 of 230 cuttings and 11 plants in (*b*), six of 231 cuttings and five plants in (*c*), and two of 456 cuttings and two plants in (*d*) contained *V. albo-atrum*. This indicates that infected cuttings are most likely to be obtained from visibly affected plants, probability decreasing with increasing distance. It is probable that the fungus was more widely distributed than the results indicated.

In a survey of the distribution of plants giving infected cuttings round isolated hops which were visibly diseased in 1943, isolation tests early the next year showed that the fungus was present in the cuttings of several of the eight or 16 surrounding, apparently healthy plants. Later in 1944 no symptoms were seen either on the plants that had shown symptoms in 1943 or on the surrounding plants. Nor was any increase noted in 1944 or 1945 in the number of plants with visible symptoms in the selected field. As experiments had already shown that a long time-lag between infection and symptom expression is unlikely [*R.A.M.*, 27, p. 584], it was concluded that the disease was not spreading. Though the number of visibly affected plants remained approximately constant, symptoms were not confined to the same plants each year.

The evidence indicates that the localization of the plants showing symptoms in one corner of the field was due to environmental factors, but no correlation could be established between such localization and soil structure or drainage.

Cooper (W. E.) & Chilton (S. J. P.). **Antibiosis of Actinomyces strains to Pythium arrhenomanes, P. ultimum, and Rhizoctonia solani.**—Abs. in *Phytopathology*, 39, 1, p. 5, 1949.

A total of 2,452 cultures of *Actinomyces* from 42 Louisiana [sugar-cane plantation] soil samples were tested for antibiosis on Czapek's agar to *Pythium arrhenomanes*, *P. ultimum*, and *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, 26, p. 216]. Antagonism towards one or more of the three pathogens was manifested by 734 (30 per cent.) of the cultures, 588 being antibiotic to *P. arrhenomanes*, 335 to *P. ultimum*, and 345 to *C. solani*. More cultures showed a higher degree of antibiosis towards *P. arrhenomanes* than towards the other two species. At least three and probably more antibiotic substances were produced by the *Actinomyces* cultures. No correlation was observed between soil type and the occurrence of strains antibiotic to *P. ultimum* and *C. solani*. The experimental data indicate that an analysis of the antibiotic potential of the *Actinomyces* present in a given soil should be based on tests against a specific fungus.

Navarrete (F. S.). **Estudio sobre la 'clorosis' de la Caña de Azúcar en El Mante, Tam.** [Study on the 'chlorosis' of Sugar-Cane in El Mante, Tam.]—*Fitofilo*, 4, 6, pp. 323–335, 2 figs., 1945.

Chlorosis of sugar-cane [*R.A.M.*, 20, p. 105] in the El Mante region of Tamaulipas, Mexico, may be caused by cold, soil deficiencies, or excessive humidity. The symptoms of the disease are described and its etiology discussed in relation to each of the three operative factors.

Steib (R[ene] J.). **Studies on penetration and infection of Sugarcane stalks by Physalospora tucumanensis.**—Abs. in *Phytopathology*, 39, 1, p. 23, 1949.

The results of previous experiments indicated that the scales on the buds of sugar-cane stems contract infection with the red rot pathogen (*Physalospora tucumanensis*) [in Louisiana: *R.A.M.*, 27, p. 495] in a latent form. The fungus has been cultured from buds that had been surface-sterilized for up to 24 hours in a mercuric chloride solution. Buds with infected scales develop red rot under favourable conditions. Penetration of the bud scale epidermis by infection hyphae was observed 33 hours after inoculation with conidial suspensions. A cap or overgrowth round the infection hypha was formed in both a resistant and a susceptible variety. Mycelium was detected in the subepidermal cells only where the epidermal cells were thin-walled. In the resistant variety under observation the cap could be seen in both the epidermal and subepidermal cells. A gummy, dark red material often filled the intercellular spaces below the point of invasion, a smaller quantity being present in the resistant than in the susceptible variety. The leaf sheaths of the young shoots of a susceptible variety became infected from the bud scales. Such diseased buds often failed to germinate.

Konrad (P.) & Maublanc (A.). **Les Agaricales. Classification, revision des espèces, iconographie, comestibilité.—Agaricaceae.** [The Agaricales. Classification, species revision, iconography, edibility.—Agaricaceae.]—469 pp., 1 pl., Encycl. mycol., 14, Lechevalier, Paris, 1948 [1949].

In the introductory pages the authors discuss poisoning by mushrooms, then classification, which is essentially that of their *Icones*. The Agaricales are divided into six families, the Boletaceae and five families of gill fungi. This work includes only the largest of these families, which they designate the Agaricaceae. The European species, and particularly those of France, are included, each with notes, but not a full diagnosis, followed by a list of approved illustrations. None of the species or combinations entered is marked as new. Agaricologists will undoubtedly

find the book most useful and they will be familiar with the names used; *Armillaria mellea*, for example, is included in *Armillariella*.

Hansford (C. G.). **Tropical fungi. III. New species and revisions.**—*Proc. Linn. Soc. Lond., 1947–48*, 160, 2, pp. 116–153, 1949.

This paper is a continuation of No. II in this series (*Proc. Linn. Soc. Lond.*, 159, pp. 21–42, 1947) and includes descriptions of 37 new species, 14 new combinations, and three new varieties found in the National Herbarium, Pretoria.

Nicolas (G.) & Aggéry [Berthe]. **Notes phytopathologiques (cinquième note).** [Phytopathological notes (fifth note).]—*Bull. Soc. Hist. nat. Toulouse*, 82, 1–2, pp. 123–130, 1947.

Among the pathogens recorded in this list from the University of Toulouse [cf. *R.A.M.*, 27, p. 258] may be mentioned *Sorosporium saponariae* on *Saponaria officinalis*, *Puccinia cynodontis* on *Cynodon dactylon* [cf. ibid., 8, p. 93], *Uromyces pisi*, *U. striatus*, and other *U.* spp. on *Euphorbia cyparissias* [ibid., 25, pp. 387, 454], *U. galegae* on *Galega officinalis*, *Phyllactinia suffulta* [ibid., 27, p. 158], parasitized by *Cicinnobolus parasiticus* on ash (*Fraxinus excelsior*), and *Cercosporella inconspicua* on *Lilium martagon* [ibid., 20, p. 364].

Maneval (W. E.). **A supplementary list of Missouri fungi.**—*Univ. Mo. Stud.*, 22, 3, pp. 1–65, 1 pl., 1948.

The present publication is supplementary to the author's earlier list [*R.A.M.*, 16, p. 838] and follows the same general plan. It includes all available records of parasitic fungi and virus diseases recorded for Missouri since 1937. The total number, parasites and saprophytes, in this and the earlier list amounts to approximately 1,500 on over 900 hosts. The present list itself includes about 500 fungi and diseases, of which some 180 are new [to the State]. The bibliography comprises 190 titles.

Coker (W. C.). **Notes on Carolina fungi.**—*J. Elisha Mitchell sci. Soc.*, 64, 2, pp. 287–303, 17 pl., 1948.

Notes on 17 Hymenomycetes from Carolina, including one new species and *Polyporus balsameus* causing a brown rot of coniferous trees, are given, together with a key to nine fleshy, stipitate polypores of North Carolina.

Blumer (S.). **Beiträge zur Kenntnis der Erysiphaceen.** [Contributions to the knowledge of the Erysiphaceae.]—*Ber. schweiz. bot. Ges.*, 58, pp. 61–68, 1948.

During the recent relatively warm and dry years several powdery mildews were prevalent in Switzerland [*R.A.M.*, 28, pp. 113, 114], especially in 1947, when a serious outbreak of apple mildew (*Podosphaera leucotricha*) [see above, p. 324] occurred in eastern Switzerland and apple crops in the western part of the country suffered serious losses. In addition to Landsberger Reinette [ibid., 26, p. 157] Jonathan, Ontario, Boiken, and Transparent de Croncels were particularly susceptible, Gravensteiner, Boskoop, and others being also occasionally heavily attacked. In the same season the author found the pathogen on pears (Esperens Bergamotte, Diels Butterbirne, and Frühe von Trevoux), but the infections were weak and did not spread.

The dry and hot conditions probably favoured the development of perithecia of *Sphaerotheca pannosa* on rose, *P. leucotricha* on apple, *Microsphaera alphitoides* on oak, and *Uncinula necator* on vine, all of which were observed in the autumn of 1947. The ten new powdery mildew records in Switzerland include one on lupin, tentatively attributed to *Erysiphe pisi*.

Lowe (J. L.). **Studies in the genus Poria. IV. Brown type material.**—*Lloydia*, 11, 3, pp. 163–170, 11 figs., 1948.

Descriptive notes are given, based on the type of materials, of 34 species (14 of which are now relegated to synonymy) of *Poria* found in North America [cf. *R.A.M.*, 22, p. 40; 25, p. 422; 27, p. 166].

Cunningham (G. H.). **New Zealand Polyporaceae. 6. The genus Coltricia.**—*Bull. Dep. sci. industr. Res. N.Z.* 77, 10 pp., 3 pl., 1948.

In continuation of the classification of the Polyporaceae of New Zealand [cf. *R.A.M.*, 28, p. 33 and next abstracts] the author gives the type locality, distribution, habitat, and descriptions of nine species of *Coltricia*, all of which have an annual stipitate hymenophore with monomitic, brown hyphae and clavate type basidia, including *C.* [*Polyporus*] *schweinitzii* n.comb. on *Agathis australis*. Under the tribe Fomiteae I it is proposed to group pileate species with context composed of hyphae with walls definitely yellow-brown or chestnut brown when seen under the microscope. A key to the species and a host-species index are provided.

Cunningham (G. H.). **New Zealand Polyporaceae. 7. The genus Inonotus.**—*Bull. Dep. sci. industr. Res. N.Z.* 78, 5 pp., 2 pl., 1948.

Karsten's genus *Inonotus* has been revived and emended to contain species of the Polyporaceae [see preceding and next abstracts] with an annual sessile hymenophore, brown, monomitic hyphae without clamp connexions, honeycomb type basidia and brown, ventricose or subulate setae. The type locality, distribution, habitat, and descriptions are given of two species, including *I. nothofagi* n.sp. growing imbricate on bark or decorticated wood of standing *Nothofagus* spp. and causing a white rot. A key to the species and a host-species index are provided.

Cunningham (G. H.). **New Zealand Polyporaceae. 8. The genus Fomes.**—*Bull. Dep. sci. industr. Res. N.Z.* 79, 24 pp., 6 pl., 1948.

In classifying the Polyporaceae of New Zealand [see preceding and next abstracts] the genus *Fomes* is used to contain perennial, pileate species having a dimitic hyphal system, brown hyphal walls, no clamp connexions, and a sessile hymenophore with stratose pores. The type locality, distribution, habitat, and descriptions of 17 species of *Fomes* are given, including *F. uncatus* n.sp. associated with a brown pocket-rot of standing dead *Dysoxylum spectabile*, *Metrosideros robusta*, *M. tomentosa*, and *Nothofagus menziesii* trees, *F. scruposus* n.comb. syn. *Polyporus scruposus* associated with a white rot of bark or decorticated wood of standing or fallen dead trunks and branches of many trees, *F. endozonus* n.comb. syn. *P. enzonatus* associated with a white rot of dead standing trunks and branches of forest trees, *F. awhitu* n.sp. associated with a white rot of fallen trunks, *F. setulosus* to which all collections previously designated *F. robustus* [*R.A.M.*, 7, p. 406] are referred, *F. mastoporus* f. *rugosus* n.f., which is probably the most abundant species of *Fomes* present in the Dominion, and *F. brownii* to which specimens named *F. australis* [loc. cit.] are now referred. A key to the species and a host-fungus index are provided.

Cunningham (G. H.). **New Zealand Polyporaceae. 9. Trametes, Lenzites, and Daedalea.**—*Bull. Dep. sci. industr. Res. N.Z.* 80, 10 pp., 4 pl., 1948.

The genus *Trametes* has been revised and the name is now applied to a small group of annual or biennial species of Polyporaceae [see preceding abstracts] with a trimitic hyphal system, clamp connexions present in generative hyphae, walls of skeletal and binding hyphae coloured some shade of brown, perhaps only faintly, and a poroid hymenium. Thus defined it becomes the brown-coloured equivalent of *Coriolus*. In *Lenzites* the walls of the context hyphae are hyaline and the

hymenium is labyrinthiform or lamellar. *Daedalea* has a similar hymenium but in other respects resembles *Trametes*. The type locality, distribution, habitat, and descriptions of three species of *Trametes*, two of *Lenzites*, and one of *Daedalea* are given, including *T. tawa* n.sp. associated with a white rot of the bark of dead upright branches of forest trees. A key to the species and a host-fungus index are provided.

Ramakrishnan (T. S.) & Ramakrishnan (K.). **Exobasidium from South India.**—*Proc. Indian Acad. Sci.*, Sect. B, **29**, 1, pp. 5–11, 1 pl., 5 figs., 1949.

The occurrence of a severe outbreak of blister blight (*Exobasidium vexans*) on tea in South India [*R.A.M.*, **26**, p. 317] aroused interest in the genus, and five other species collected on tea estates are described in this critically annotated list. Three are new to science and one (*E. vaccinii*) [ibid., **26**, p. 565] is a new record for India.

Ling (L.). **Nota sinonimica sobre Cintractia peribebuyensis.** [Note on the synonymy of *Cintractia peribebuyensis*.]—*Rev. argent. Agron.*, **15**, 4, pp. 254–255, 1948.

From a critical examination of three collections of the smut on *Cyperus* sp. originally described in 1888 by Spegazzini from Paraguay as *Cintractia peribebuyensis* [cf. *R.A.M.*, **28**, p. 198], the author concludes that two, namely, the type collection and one on the same host from Brazil, are identical with *C. axicola* (Berk.) Cornu 1883, while the third, also from Paraguay, is *C. leucoderma*.

Wallace (G. B.). **Defoliation of crops by a gemmiferous fungus.**—*E. Afr. agric. J.*, **14**, 3, pp. 141–143, 6 figs., 1949.

The fungus disease causing defoliation of tea and coffee plants first observed in 1934 [*R.A.M.*, **14**, p. 13] in two of the higher parts of the Southern Highlands Province, Tanganyika, was again observed on one tea plantation in the West Usambara Mountains in 1948. The causal organism is a Basidiomycete, reproducing vegetatively by means of small club-shaped gemmae [ibid., **14**, p. 184], which detach easily and cause new infections. They average 0·8 by 0·21 mm. on tea and 0·82 by 0·22 mm. on coffee leaves. A second crop of gemmae after the original ones have been blown off has been observed to form on the pedicels. Coffee cherries can be infected at all stages of growth. The disease spreads to the stalk and the cherries drop. The trouble has greatly diminished in the Southern Highlands where conditions have been improved. The host range of the fungus is very wide but this is not considered to indicate intense parasitism except under exceptional circumstances.

Matsumoto (T.) & Lee (C. H.) **A simple method of preserving Tobacco mosaic sera.**—*Phytopathology*, **38**, 12, pp. 1031–1032, 1948.

The following method of preservation of tobacco mosaic sera has proved satisfactory at the National Taiwan (Formosa) University, China. The immune sera, about 0·5 c.c. in volume, are distributed into sterilized test tubes and immediately dried with sulphuric acid *in vacuo* for several hours, or overnight at the longest, after which they adhere firmly to the wall of the tube. They are then plugged, sealed with paraffin, and stored in a laboratory chest (as cool as possible). When required for use sufficient distilled water is added to bring the serum concentration to the original strength, and the tube is kept within a temperature range of 15° to 30° C. On complete dissolution in water (which takes several hours) the sera are of the same degree of transparency as when frozen, or sometimes very slightly turbid. The titre of one dried antiserum was not reduced in comparison with a frozen sample in tests made after 232 days, while in another case there was only a slight reduction of titre in the dried preparation after 306 days.

Haslam (R. J.). **The study of Burley varieties.**—*Lighter* (*Dep. Agric., Can.*), 19, 1, pp. 10–16, 1949. [Mimeographed.]

Of the new Burley tobacco varieties developed at the Dominion Experimental Station, Harrow, Ontario, Haronova possesses a high degree of resistance to black root rot (*Thielaviopsis basicola*) [*R.A.M.*, 27, p. 340], is a better yielder, and is less susceptible to brown root rot [ibid., 28, p. 90] than one of its parents Harrow Velvet, the other being Station Standing; the promising strain 37003, still in the process of selection, shows a marked resistance to both rots [cf. above, p. 327].

Schroeder (W. T.). **The control of blossom-end rot of Tomato with emulsified hydrocarbon sprays.**—Abs. in *Phytopathology*, 39, 1, pp. 21–22, 1949.

A greenhouse experiment in the spring of 1948 indicated that an emulsified hydrocarbon spray (dowax 222) might be of practical value in the control of tomato blossom-end rot in the field. On the following 8th and 16th July, therefore, the preparation at a strength of 1 and 2 gals. per 100 of water was applied at the rate of 200 gals. per acre to some of 40 plant plots distributed at random in each of four blocks, the untreated plots serving as controls. Counts made during the harvest season showed 55 per cent. control of the disease for the lower concentration of dowax 222 and 70 per cent. for the higher. Yields of 14·3, 16, and 17·5 tons per acre of No. 1 equivalent fruit from the untreated plots and those sprayed with the emulsion at 1 and 2 gals., respectively, were significantly correlated with blossom-end rot control. No significant differences were obtained among treatments in respect of number or size of harvested fruits per plant or percentage of culls exclusive of that resulting from blossom-end rot, indicating that the increase in yield was due to control of the disease.

Hodgson (R.), Peterson (W. H.), & Riker (A. J.). **The toxicity of polysaccharides and other large molecules to Tomato cuttings.**—*Phytopathology*, 39, 1, pp. 47–62, 1 fig., 1 graph, 1949.

At the Wisconsin Agricultural Experiment Station the wilt-inducing properties of various polysaccharides and polymers (in 0·1 and 0·4 per cent. aqueous solution) on tomato cuttings were studied under controlled environmental conditions.

Various polysaccharides of both plant and microbial origin caused wilting, the leaflets being primarily affected by the water-soluble preparations forming clear solutions, while the less soluble substances yielding opalescent solutions caused flaccidity particularly of the petioles and stems. Comprised in the former group were fructosans, glucosans, and maize syrup dextrins, and in the latter, glucosans and a pentosan (xylan).

Among the polysaccharides primarily affecting the leaflets, a mild form of injury by the glucosans of *Bacterium tumefaciens* and maize syrup dextrins was expressed by curling and rolling of the leaflet tips and edges, while inulin and soluble starch caused a collapse of the outer portions, leaving a turgid area round the midvein. In the more severe injury resulting from the use of higher concentrations, the symptoms in both cases often consisted of complete desiccation and necrosis of the whole leaflet. Particular attention was paid to the polyethylene glycols, carbowaxes 1540, 4000, 6000, and 9000, all of which caused wilting of the leaflets. Of the polyvinyl alcohols tested, those of low and medium molecular weight, e.g., 11,500 and 40,000, caused wilting principally of the leaflets, while another with a weight of about 52,000 induced flaccidity mainly of the petioles and stems. In all cases a direct relationship could be traced between molecular weight of the substances and their capacity for the inducement of leaflet wilt. Their toxicity is assumed to be due to mechanical interference with the transpiration system, the exact site of which could not be determined, though it seems possible that the substances might accumulate, for instance, in the large vessels at the ends of the vein islets, or within the cells, according to their size.

Hofmeyr (J. D. J.), Nel (E. A.), & Loest (F. C.). **A new Tomato variety.**—*Fmg S. Afr.*, 23, 273, pp. 805–808, 2 figs., 1948.

The new tomato variety 'Hortus 5', which possesses a high degree of resistance to *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, 27, p. 351], was developed at the Subtropical Horticultural Research Station at Nelspruit, South Africa, from the most resistant selections (as determined by artificial inoculation with the fungus) derived from seed supplied by Bohn and Tucker [ibid., 18, p. 766] from their most resistant plants. Resistance to wilt is associated with the round or pear-shaped type of fruit and susceptibility with the flat type. Although at first immune from wilt Hortus 5 has since developed a measure of susceptibility, but even so its degree of resistance is high.

Du Toit (J. J.). **The control of spotted wilt of Tomatoes.**—*Fmg S. Afr.*, 23, 273, pp. 786–788, 1948.

Experiments were carried out at Stellenbosch, South Africa, during 1946 and 1947, to determine the effect of various insecticides on thrips [*Thrips tabaci*], the chief vector of spotted wilt of tomatoes [*R.A.M.*, 27, p. 275]. Treatments with 4 per cent. nicotine dust (weekly), 0·5 per cent. gammexane (fortnightly), and 5 per cent. DDT (three-weekly) on plots from which all diseased tomato plants were removed twice a week, resulted in 65·91, 67·42, and 63 per cent. healthy plants, respectively, compared with 37·12 for the untreated.

It is recommended to dust plants in the seed-bed lightly but thoroughly with 4 per cent. nicotine dust every two or three days; DDT is harmful at this stage. Strong and healthy plants only should be transplanted and set out twice as densely as usual; one week later 4 per cent. nicotine dust should be applied, followed by two more dustings at weekly intervals. In addition every third week 5 per cent. DDT should be applied lightly, but evenly, up to six weeks after the first picking. It is important to remove all infected plants immediately and continue roguing until most of the fruits start to ripen. Weeds should be kept down at all stages.

Dietz (S. M.) & Young (R. A.). **Oak wilt—a serious disease in Iowa.**—*Bull. Ia agric. Exp. Sta.* P91, 20 pp., 3 pl., 11 figs., 1948.

In the past five years wilt (*Chalara quercina*) [*R.A.M.*, 24, p. 79; 28, p. 117] has become the most destructive oak disease in the upper Mississippi valley and has spread into Missouri. Trees of the red oak group are usually killed 30 to 60 days after the first wilt symptoms appear, while those of the white oak group may survive several years, with only a few branches being killed each year. In addition to the susceptible species already reported, *Quercus marilandica* has been found naturally infected and *Q. laurifolia*, *Q. nigra*, and *Q. virginiana* var. *maritima* have proved susceptible to inoculation in the greenhouse.

No effective control measure and no resistant species have so far been found. The removal of all diseased trees and all neighbouring red oaks within 50 to 100 ft. appeared to be an effective sanitary measure, no new infections having been noticed after three years.

Buchwald (N. F.) & Jørgensen (H. A.). **Er der nogen Sammenhæng mellem Klimæt og Fremkomsten af frugtlegemer hos Polyporus dryadeus (Pers.) Fr.?** [Is there any connexion between the climate and the development of fruit bodies in *Polyporus dryadeus* (Pers.) Fr.?]—*Friesia*, 3, 5, pp. 381–387, 1 fig., 1948. [English summary.]

The discovery in February, 1948, of an exceptionally large and well-developed fruit body of *Polyporus dryadeus* at the base of an old oak in Lolland, Denmark, following the unusually hot and dry summer of 1947, raised the question of the alleged connexion between sporophore production in this fungus and abnormally

high temperatures. *P. dryadeus* is a rarity in Denmark, where it has been observed on less than 20 occasions since 1892. In most of these years the temperature was normal or below and precipitation normal to heavy, so that no correlation can be established between fruit body development in the oak polypore and unusually hot summer conditions.

Toole (E. R.) & Hepting (G. H.). **Selection and propagation of Albizzia for resistance to Fusarium wilt.**—*Phytopathology*, 39, 1, pp. 63–70, 1 fig., 1949.

Twenty *Albizzia* trees out of 1,437 seedlings from seed collected from Maryland to Louisiana, in two experiments (1940 to 1942) at Tryon, North Carolina, to determine resistance to wilt (*Fusarium oxysporum* f. *perniciosum*) [*F. perniciosum*: *R.A.M.*, 27, p. 299] have survived the disease for as long as eight years, despite repeated root inoculations, while neighbouring 'volunteers' have died. The resistant individuals represent four parent trees of *A. julibrissin* and one each of its var. *rosea* and *A. kalkora*. Many more trees have also survived more recent experiments (1946–7), and resistance to the disease has further been shown by 56 per cent. of the progeny of seed arising from uncontrolled pollination in 1946 of several of the six- and seven-year-old resistant selections.

All the cuttings rooted from the resistant selections appear so far to be immune from wilt notwithstanding successive inoculations, whereas rooted cuttings from adjacent susceptible wildlings contracted the disease and died following artificial infection.

Experiments demonstrated the rooting superiority of root and hardwood over stem and greenwood cuttings, the use of the propagation box in preference to the greenhouse bench, and no storage rather than pre-storage of cuttings in moist sand. Root cuttings rooted well without hormone treatment; hardwood cuttings throve if they originated from robust young trees, were thicker than 0·3 in., waxed at the upper end, and soaked in a suitable hormone solution, e.g., indole butyric acid at 100 p.p.m.; greenwood cuttings rooted well and without hormone treatment only if they had sprouted from root cuttings.

Large (J. R.). **Parasitic diseases of Tung.**—*Plant Dis. Reptr*, 33, 1, pp. 22–30, 1949. [Mimeographed.]

Notes are given on the symptoms, local distribution, damage caused by, and control of eight fungus and bacterial diseases most commonly attacking tung [*Aleurites* spp.] in the southern United States, viz. bacterial leaf spot (*Bacterium* [*Pseudomonas*] *aleuritidis*) [*R.A.M.*, 12, p. 130; 18, p. 378], alcoholic flux (cause not yet determined) [ibid., 23, p. 417], thread blight (*Corticium stevensii*) [*C. koleroga*: ibid., 23, p. 504], web blight (*C. microsclerotia*) [ibid., 24, p. 80], black rot canker (*Physalospora rhodina*) [cf. 22, p. 180], nut rot (*Botryosphaeria ribis*) [cf. 21, p. 4], canker due to *Septobasidium pseudopedicellatum* [ibid., 25, p. 234], and root rot (*Clitocybe tabescens*) [cf. ibid., 25, p. 186]. Of these, thread blight and nut rot are at present the most serious. Thread blight is controllable by spraying once a year (generally between 20th May and 10th July) with Bordeaux mixture (6–6–100), but no control of nut rot has yet been found, except by improving cultural conditions. Three other diseases affecting tung in the United States, but of minor importance, are leaf spot (*Gloeosporium aleuriticum*), southern blight (*Sclerotium rolfsii*) [ibid., 13, p. 78], and *Phytophthora* root rot (*P. cinnamomi*).

Pimentel (A. A. L.). **Novas observações sôbre a morfologia, biologia e fisiologia de dois fungos do género Phytophthora de Bary, parasitas do Castanheiro.** [New observations on the morphology, biology, and physiology of two fungi of the genus *Phytophthora* de Bary, parasites of the Chestnut.]—*Agron. lusit.*, 7, 4, pp. 337–353, 1 pl., 1945. [English summary. Received March, 1949.]

In a previous paper entitled 'Comparative study of two fungi of the genus

Phytophthora de Bary', presented at the First National Congress of Agrarian Sciences, Lisbon, in December, 1943, the author designated as *Phytophthora* A a parasite of chestnut, walnut [cf. *R.A.M.*, 27, p. 395], *Pseudotsuga douglasii* [*P. taxifolia*], and oak (*Quercus robur*) seedlings collected in Portuguese nurseries in 1941 and 1942. In 1943 the same fungus was isolated from cork oak (*Q. suber*) and in 1944 from birch (*Betula alba*). Another strain, named *Phytophthora* B, was obtained only from chestnuts in a single nursery.

Further studies on these pathogens included inoculation experiments with isolates of strain A from all its hosts, and with B, on a number of forest seedlings besides the above-mentioned. The results showed that neither strain was specific to its own hosts and that A was the more pathogenic of the two. The chestnut, walnut, *Pseudotsuga taxifolia*, oak, and cork oak isolates of A produced 100 per cent. infection on *Cedrus atlantica*, while fully positive results were also obtained in the tests on *C. atlantica*, *Abies nordmanniana*, *A. pectinata*, and *A. sibirica* with the walnut isolate; on chestnut, *P. taxifolia*, and *A. sibirica* with that from birch; on chestnut, *P. taxifolia*, *C. atlantica*, *A. nordmanniana*, and *A. pectinata* with the *P. taxifolia* collection; on *Q. robur*, *C. atlantica*, and the three *A.* spp., with the *Q. robur* isolate; and on chestnut, *C. atlantica*, *A. pectinata*, and *A. sibirica* with that from *Q. suber*. Strain B caused a maximum of 85 per cent. infection on chestnut. *Castanea crenata* var. *tamba* contracted 80 per cent. infection from the chestnut, walnut, and both oak isolates of A and from the one collection of B, and 40 and 60 per cent., respectively, from the birch and *P. taxifolia* isolates of A.

Discussing the identity of *Phytophthora* A and B, the author now finds that the morphological, biological, and physiological differences between them are more extensive than those usually recognized as a basis for the separation of strains or even of varieties. Hence his original conclusion that A and B represent strains of *P. cambivora* requires some modification, and B is now referred to Urquijo Landaluze's group (1) [ibid., 22, p. 52; see also 26, p. 364], which he regards as authentic *P. cambivora*, while A, corresponding to group (2), is provisionally regarded as a new species. In the meantime, however, further comparative studies on *P. cambivora* and *P. cinnamomi* are desirable in view of the affinities of the latter with the isolates comprising group (2), notably in respect of the possession of chlamydospores.

Campbell (W. A.). **A method of isolating Phytophthora cinnamomi directly from soil.**—*Plant Dis. Reptr*, 33, 3, pp. 134–135, 1949. [Mimeographed.]

Phytophthora cinnamomi was isolated from the soil around fine roots of shortleaf pines [*Pinus echinata*] affected by little leaf [*R.A.M.*, 27, p. 224; 28, p. 147; cf. also 24, p. 295], at Athens, Georgia, by the following method. Soil samples, taken to the desired depth round an affected tree, were placed in paper bags. A portion of each sample was tightly packed into a ½ in. hole bored with a cork borer diagonally downward, but not quite through, an apple, filling the hole to within ½ to ¾ in. from the top. The remaining space was filled with distilled water. When the soil had become saturated, the opening was sealed. Each soil sample was tested in two apples. The inoculated apples were kept at room temperature (60° to 80° F.).

P. cinnamomi, if present, caused a firm, dry rot in five to ten days, the presence of the fungus being confirmed by examination of the mycelium which developed on maize meal agar round pieces of rotted apple. By this method *P. cinnamomi* was recovered from 75 per cent. of soil samples from the root areas of affected pines. Golden Delicious apples gave the most satisfactory results, partly because they tended to dry out rather than break down at the temperatures used and because the yellow or greenish-yellow colour showed up conspicuously the brown rot caused by *P. cinnamomi*.

Davis (D. E.). **Some effects of calcium deficiency on the anatomy of Pinus taeda.**—*Amer. J. Bot.*, 36, 3, pp. 276–282, 12 figs., 1 diag., 1949.

The results of studies made in Alabama on the anatomy of two sets of loblolly pine (*Pinus taeda*) seedlings after they had been cultured for one year in solutions containing 200 p.p.m. and 2 to 5 p.p.m. calcium, respectively, are presented. The calcium deficient plants were half as tall as normal ones, and the leaves less than half the length. The needles were yellow-green to brown, twisted, and stiff with necrotic tips. The terminal buds were apparently dead. The roots were stunted and stiff with the tips mostly dead.

Jackson (L. W. R.). **'Needle curl' of Shortleaf Pine seedlings.**—*Phytopathology*, 38, 12, pp. 1028–1029, 1 fig., 1948.

'Needle curl' developed on some 200 two-year-old shortleaf pine (*Pinus echinata*) seedlings repotted in April at the Peabody School of Forestry, University of Georgia. The condition was apparently due to the temporary water deficiency caused by transplanting, subsequent growth and vigour of the seedlings being normal. Needle curl has been observed on an occasional shortleaf pine seedling growing on dry sites near Athens, Georgia, and it was also found that the condition could be induced on one-year-old seedlings of *P. echinata* and *P. caribaea* by lowering the soil moisture to wilting point just as the secondary needles are emerging from the fascicular sheaths. Curled needle growth on pine seedlings is regarded, therefore, as a drought symptom [cf. *R.A.M.*, 21, p. 313].

Jennison (M. W.). **The growth of wood-rotting fungi in submerged culture.**—Abs. in *Amer. J. Bot.*, 35, 10, p. 801, 1948.

Wood-destroying Basidiomycetes of a variety of genera causing white and brown rots [*R.A.M.*, 27, p. 342] were grown readily at 28° C. in liquid media in shaken flasks and also with forced aeration in deep cultures at Syracuse University, New York. A heavy and maximum growth of pellets of mycelium is obtained in about a week in potato extract, malt extract, maize steep liquor, Curbay B–G (condensed molasses distiller's solubles), bran extract, soy-bean meal extract, and gluten media. The fungi make optimum growth between pH 5 and 6. Under proper conditions some of the organisms will destroy finely divided wood in submerged culture.

Hirt (R. R.). **An isolate of Poria xantha on media containing copper.**—*Phytopathology*, 39, 1, pp. 31–36, 2 figs., 1949.

The isolate of *Poria xantha* used in these cultural studies originated in decaying mahogany wood collected in 1942 from the transom planking of a fresh-water cabin cruiser [*R.A.M.*, 26, p. 573]. On nutrient agar containing 0·1 per cent. copper metal only one planting out of ten made any growth, and this culture was characterized by rhizomorph-like strands. Inoculum consisting of portions of these strands readily established the fungus on other agar media containing up to 0·1 per cent. copper. The mycelium between the strands was of uniform appearance and slow growth. Attempted transfers from this mycelium to copper-containing agar were unsuccessful, but the fungus developed freely on malt extract agar without copper. It would appear from these observations that such copper tolerance as *P. xantha* may possess depends largely on the capacity of the organism to produce compact hyphal strands which, in the mass, can subsist until adjustment to the new environment is accomplished. Even then, however, growth is much slower than on nutrient agar devoid of copper. Unless care is taken to secure uniform inocula of *P. xantha* growing on agar widely varying results may be obtained in tests on copper-containing substrata. The results of this study corroborate Hartley's

statement in 'Fungi in forest products' [ibid., 27, p. 52] that general conclusions as to the efficiency of a wood preservative may be very misleading when based on a single test or on one fungus only, especially in the case of agar cultures.

EDDINS (A. H.). **Control downy mildew of Cabbage with spergon.**—*Pr. Bull. Fla agric. Exp. Sta.* 633, 4 pp., 1947. [Received March, 1949.]

In this bulletin (a revision of No. 589) the author states that in Florida cabbage downy mildew (*Peronospora parasitica*) [*R.A.M.*, 26, p. 519; 27, pp. 167, 269] is present from September to May. It develops rapidly under suitable conditions for the fungus.

Control consists in spraying with spergon (4 lb. wettable spergon per 100 gals.) or dusting with 12 per cent. spergon dust [cf. ibid., 26, p. 574]. The first application should be made a week to ten days after the seed is planted, or later, according to weather conditions, but before the disease appears. Three treatments should be made per week, or two in cold weather (night temperatures under 40° F.) with an additional application after rain or sprinkler irrigation. In narrow beds (2 to 3 rows of plants) plants under 2 in., 2 to 4 in., and 4 to 8 in. high should be dusted at the rate of 10 to 15, 15 to 20, and 20 to 30 lb. spergon per acre, the corresponding spray figures being 50 to 60, 60 to 100, and 100 to 150 gals. For beds one yard wide the corresponding dust rates are ¾ to 1, 1 to 2, and 2 to 3 lb. per 100 sq. yds., and for the spray 5 to 6, 6 to 10, and 10 to 15 gals. per 100 sq. yds.

Army regulations pertaining to plant quarantine.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 169, pp. 81–84, 1948.

The movement of personnel, supplies, and equipment to and from the United States and from one overseas area to another is attended by the risk of dissemination of infectious diseases and pests, including those of plants, and of their introduction into the United States, its territories and possessions, and into other countries. Among other precautions to be taken against the spread of infection through these channels are the restriction and prohibition of importation of certain plants and plant products, lists of which are given.

Plant quarantine import restrictions.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 169, pp. 84–105, 1948.

A revised summary given of the plant quarantine import restrictions operating in Argentina [*R.A.M.*, 16, p. 848].

The restrictions governing the importation of seed potatoes into Cuba, revised by Presidential Decree No. 235 of 6th March, 1947, are transcribed.

Supplementary information is furnished relative to the regulations governing the importation of plants and plant products into England and Wales contained in a General Licence issued 15th April, 1947, and to those similarly concerned with Scotland in the Importation of Plants (Scotland) Order of 1947 effective 1st May, 1947.

A digest is given of the plant quarantine import restrictions operating in South Africa, as promulgated under the Agricultural Pests Act of 1911 and subsequent amendments [ibid., 21, p. 240].

Official Resolution No. 3 of the Ministry of Agriculture and Development, Venezuela, dated 18th March, 1947, prohibits the importation of all citrus plants, including fruits, cuttings, seeds, and buds, on account of a new disease occurring in some other countries. Official Resolution No. 5 of 20th June, 1947, prohibits importations of fruits, vegetables, plants, and parts thereof on the persons or in the luggage of passengers, as well as the sale of these articles from ships in Venezuelan ports.